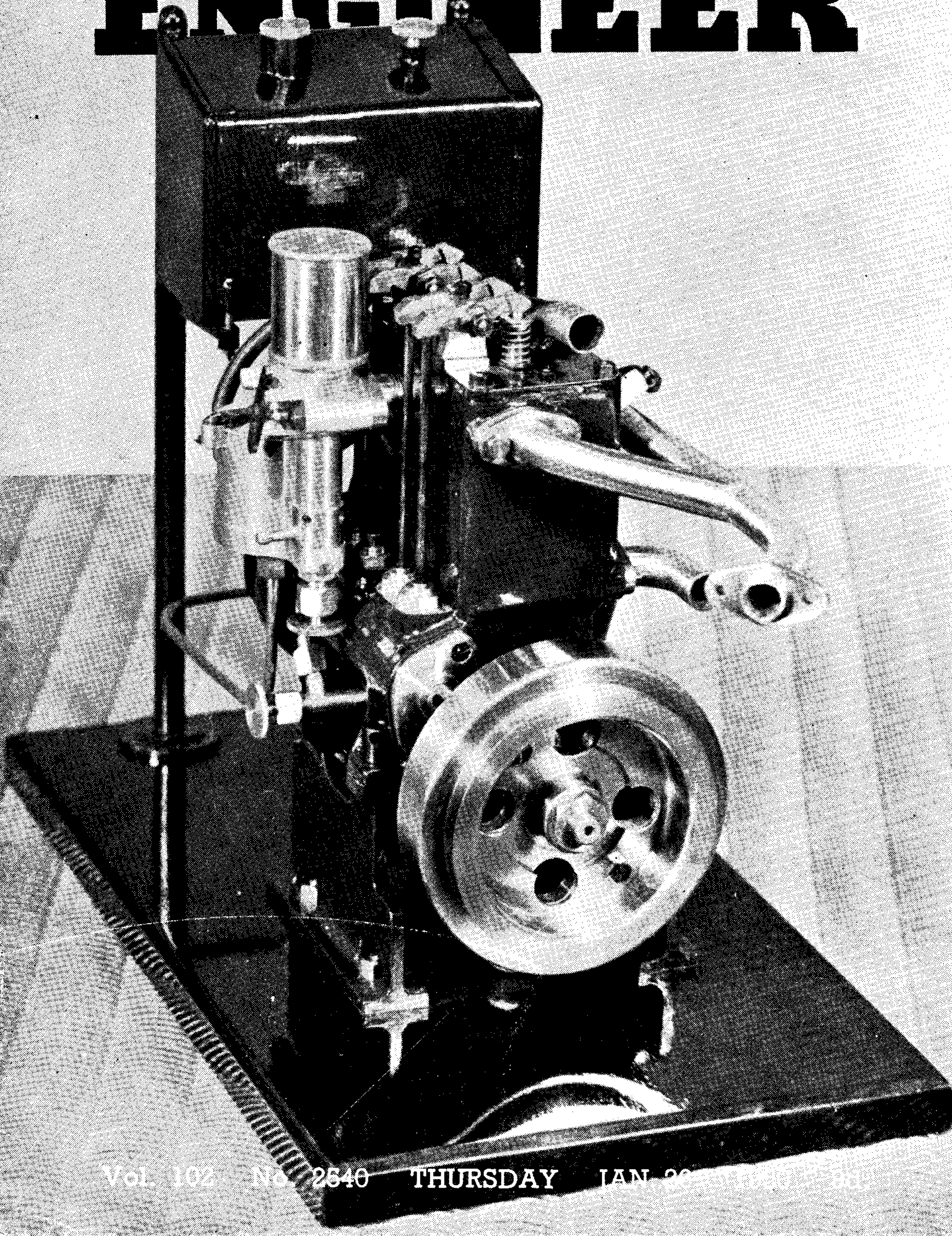
THE MODEL ENGINEER



Vol. 102 No. 2540 THURSDAY JAN. [illegible]

The MODEL ENGINEER

PERCIVAL MARSHALL & CO. LTD., 23, GREAT QUEEN ST., LONDON, W.C.2

26TH JANUARY, 1950 — VOL. 102 NO. 2540

SMOKE RINGS

Our Cover Picture

● THE $3\frac{1}{2}$-IN. gauge petrol-driven locomotive "1831" which was designed by Edgar T. Westbury and described in THE MODEL ENGINEER during the war has proved to be an extremely popular model among constructors who wish to make something entirely different from the usual type of steam locomotive ; and apart from its interest as a complete model, its separate components in themselves have been considered suitable for construction as independent models, or adaptation to other purposes, by many of our readers. We have already described in THE MODEL ENGINEER how the transmission gear of the "1831" has been adapted to a purpose entirely different from that originally intended in its design, and we have also heard news of the "1831" engines being employed for marine and stationary work, for which they are quite well suited. The model illustrated was one of a pair constructed by Messrs. S. W. and R. H. Blackley, of Loamhead, Midlothian, one of which is being incorporated in the complete locomotive and the other, which is illustrated on the cover of this issue, is being used as a stationary engine. Mr. S. W. Blackley informs us that it was rather a coincidence that both he and his brother decided to build this engine at the same time. They ordered two sets of castings and built the two engines between them, making each part interchangeable, and working to very close limits. This trouble was repaid, for when they came to assembly, no difficulty whatever was encountered. One of the engines was displayed at the Edinburgh Society of Model Engineers exhibition ; the other one has been on test, and is now tuned up ready to go into the locomotive when it is constructed. The petrol tank shown at the back of the engine in the photograph is actually the one that was constructed for the locomotive, where it will, in accordance with the design, be situated at the side of the engine.

Doncaster M.E.S. Co-operates

● IN CONNECTION with the "Doncaster Can Engineer It" exhibition which, as we have already announced, will be held in the Technical College, Doncaster, from February 4th to the 11th, we learn from Mr. Harland Brownless, hon. secretary of the Doncaster Model Engineering Society, that this energetic body of model engineering enthusiasts has been invited to take part in the exhibition. Already, some 40 models have been listed as the society's contribution to the show, and this is certainly a fitting acknowledgment of the generous allocation of space which the Doncaster Engineering Society has placed at the disposal of its guests. The cordial relations which exist between the senior society and its younger contemporary are aided by the fact that Mr. H. Bramley, secretary of the former body, is president of the latter, and makes co-operation between the two a simple matter. Long may it continue !

Removable Boiler Flues

● MR. V. H. MESSER's recent article dealing with the Robey portable engine which had the boiler flues so arranged that they could be readily removed bodily for cleaning purposes, attracted much attention from readers.

In THE MODEL ENGINEER for March 4th, 1943, we published a long letter from W./Cm. J. W. G. Eady, referring to steam engines in Africa, and mentioning a Marshall portable engine which, from the photograph reproduced on the cover of the same issue, obviously has a removable-flue boiler.

Several correspondents, however, point out that Mr. Messer's statement that Robeys "it seems, did not build traction engines" must be due to some erroneous information. The firm, at one time, produced a considerable number of traction engines which won much popularity. Mr. A. T. Holden, of Pinner, comments: "I have before me a catalogue of Robey traction engines, road rollers and tractors. Quite a number of their road locomotives appear to have been exported to Australia, as the catalogue contains photographs of these fine engines at work in New South Wales, road making."

A Suggestion from the U.S.A.

● A READER in California, U.S.A., in the course of a long and interesting letter, writes: "I should like to suggest that some of your very capable contributors might be willing to prepare an article on the construction of a twist-drill sharpener for use with small drills, say $\frac{1}{16}$ in. to $\frac{1}{4}$ in. I am referring to the drill support itself, not to the grinding-wheel and stand, which I assume most of us already have. I gather that all of us have difficulties in sharpening these small sizes, and it seems to me that anyone who can make a steam locomotive can make a sharpener, with the aid of a little advice and a few dimensions. Mention has been made in THE MODEL ENGINEER that such tools are difficult to construct, but I can't see why. I hoped that 'Duplex' in his article which started in the October 6th issue was going to do the job, but he only showed a Potts sharpener in two illustrations and gave no description."

We are fairly certain that, somewhere in the back issues of THE MODEL ENGINEER, twist-drill sharpeners have been described and illustrated by readers who have made them; but we cannot recall one in recent years. We would be pleased, however, to hear from anyone who has not only made a sharpener but used it and found it satisfactory for the small sizes of drills. We have known people who have *made* such gadgets but found them hopeless to *use*.

The Vertical-boiler Road Roller

● IT WOULD seem that the type of road roller illustrated in our issue for November 24th last, is not yet quite extinct in this country. We have not seen one for about twenty years, but three recent letters refer to specimens that were very much more recently at work. Mr. J. L. Beilschmidt, of Welwyn, mentions one which he saw working in Ipswich about three years ago, and he states that polished copper bands round the boiler lagging and a copper cap on the chimney were conspicuous features. Perhaps some Ipswich reader could supply information as to when this machine ceased to work.

Sapper T. Lees, of Longmoor, Hants, states that there is a roller of this type standing in a yard alongside the railway between Poulton and Layton, Lancs; but he has not yet had an opportunity to inspect it, though he adds that it has no canopy.

Mr. J. L. Clark, District Engineer, London Electricity Board, N.E. Sub-Area, mentions one which he saw working in the Municipal Gardens, Yarmouth, Norfolk, last June. He describes it as being in excellent condition and adds: "It was employed in surfacing asphalt paths. Having seen other examples of this type of machine, I did not realise that there was anything unusual about it, and did not take any particulars." Has any Yarmouth reader got a photograph of this specimen? If so, we would like to have a print of it.

A Silver-grey "City"

● WHAT IS described as a metallic masterpiece, a vast edifice of silver-grey metal, complete with pavilions, avenues and a great triumphal arch, will be the principal showpiece at the "Ideal Home" exhibition due to open at Olympia on March 7th. This great structure will be built of aluminium, 12 tons of which, including $8\frac{1}{2}$ miles of tubing and 25,000 rivets, will be used. The main arch will be approximately as tall as the Euston Gateway up to its pediment, will be strong enough to bear the distributed weight of 1,000 men; yet at its base, it will be poised on four steel pin-rollers, each only $1\frac{1}{2}$ in. diameter.

Linked to it in one integral structure will be arched pavilions roofed by blue and white canopies and side avenues spanned by vaults of metal tracery. The whole structure will cover an area of nearly 20,000 sq. ft.

Through the arch will pass the exhibition's main Broadway, on either side of which will rise slender telescopic masts of aluminium, 32 in all and each 60 ft. tall, making it a triumphal avenue befitting the displays of eminent furnishing and fabrics firms whose stands will border it. The Broadway will lead to a two-way Grand Staircase up which visitors will pass to a loggia on the gallery level from which to take a high-level view of the "silverweb city."

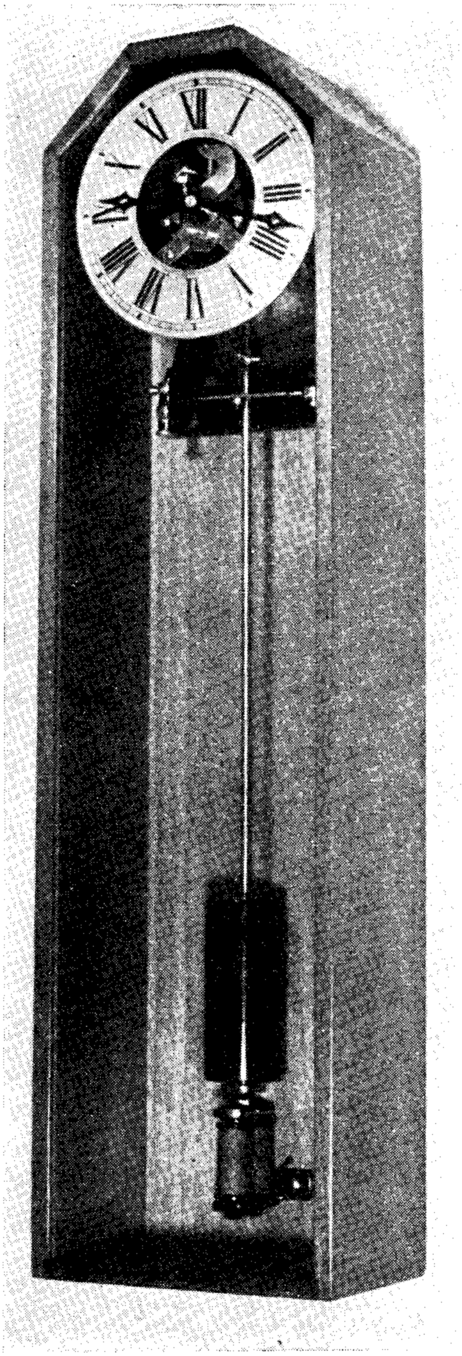
Mr. S. Kadleigh, A.R.I.B.A., a young London architect conceived the idea of this "city" of silver-grey tracery and designed it from the start as a close combination of the ideas of the designer with the arts of the precision engineer and metal craftsman.

This vast structure is now being built in sections, and will be joined together in Olympia, by J. Starkie Gardener Ltd., of Southfields, a firm which has been famous for metalcraft for more than 200 years. Incidentally, it is interesting to note that the managing director of this firm is Mr. G. H. Friese-Green, a son of the famous pioneer of cinematography and colour photography in Britain.

We have no doubt that "M.E." readers will visit the "Ideal Home" exhibition this year with more than usual interest.

A Battery-Driven Electric Clock

by C. R. Jones



THE writer, having made several electric clocks, was desirous of making one where all the movements were visible while the clock was working, and the following describes how the clock shown in the various photographs and drawings was made.

The wheelwork, and the peculiar shape of the plates, were sketched out during the last war, but nothing was done until about three years ago, when a proper design was got out and the job started. The wheelwork was just on completed when the writer was unfortunately indisposed for about ten months and the job had to be left, but on his recovery it was started again, and this time finished.

It is hoped that readers will be interested enough to make a similar clock, as it is a useful piece of work, can be made handsome in appearance, and needs no castings for its construction.

The motive power, a cycle-lamp battery, costing less than a shilling, will run it for nine months or so, also, none of the parts are very small, and are well within the capacity of most model engineers possessing a small lathe, all the work on the clock in question being done on a 3-in. Winfield lathe.

The pendulum suspension bracket and the contacts are mounted on a frame, called the main frame in the text, and the wheelwork is affixed to this by means of two studs and nuts, which allow the wheel and dial unit to be easily removed.

The clock has a three-quarter seconds pendulum and the usual " Hipp " contact system.

It is essential that the clock should be securely fixed to the wall, brass hanger brackets and " Rawlplugs " being used in this case.

No proper general arrangement drawings are given of the wheelwork, but it is thought that the photographs should be sufficient to show how the parts are assembled.

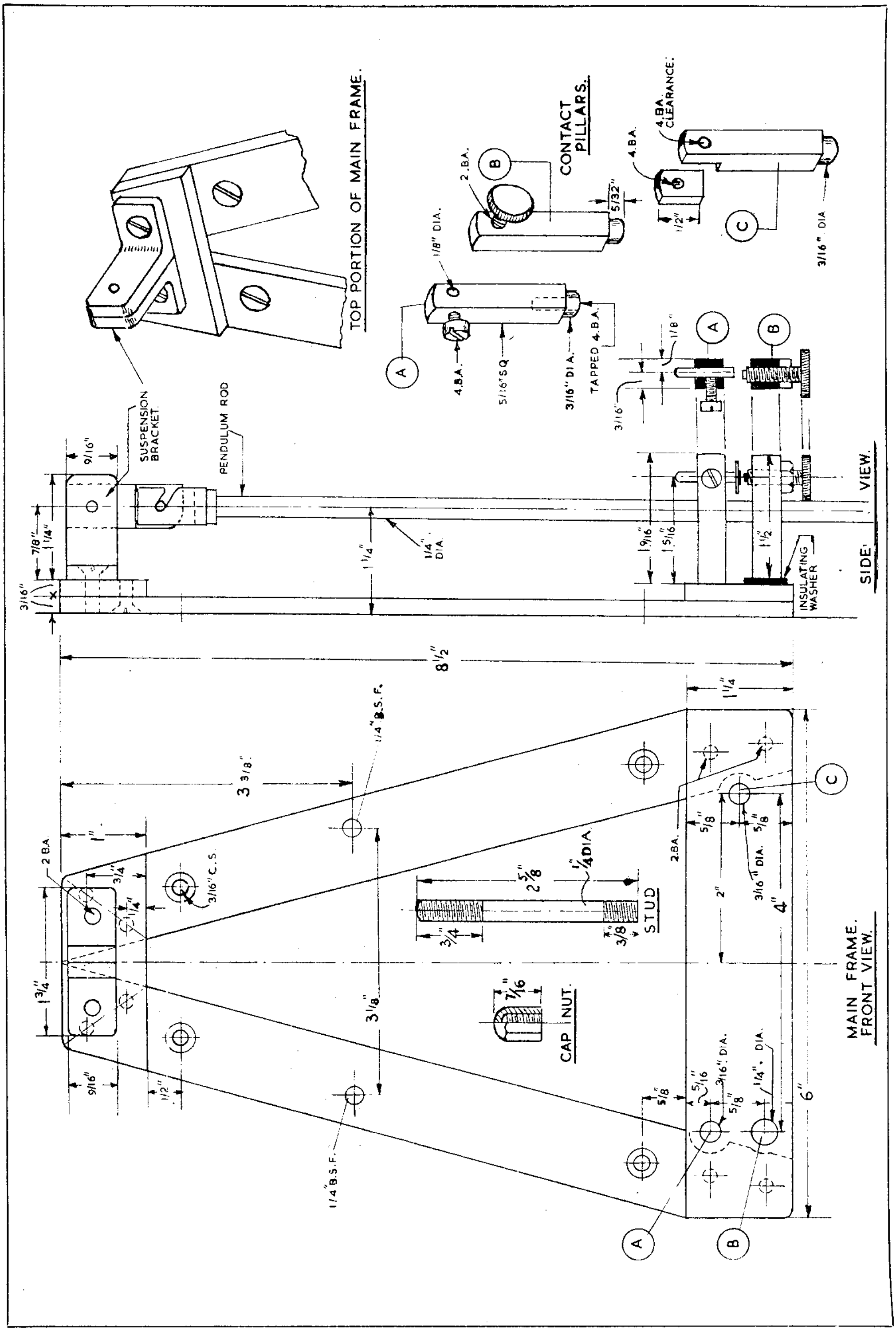
It is hoped that all essential information has been given to enable a similar clock to be made, but the writer will be pleased to give any additional information he can, *via* the Editor of THE MODEL ENGINEER.

Each section has been given the same heading as given on the drawings, enabling it to be easily identified with them, and starting with :—

The Main Frame

This was constructed of black mild-steel, the two tapered sides and the top section being of 1-in. × $\frac{3}{16}$-in. material, the lower section being of the same material but $1\frac{1}{4}$ in. in width.

The whole was cut to frame up to the finished sizes shown viz : $8\frac{1}{2}$ in. in height and 6 in. in width at the base. It was held together by two No. 2-B.A. countersunk steel set-screws at each corner, these being screwed in from underneath,


TOP PORTION OF MAIN FRAME.
CONTACT PILLARS.
SUSPENSION BRACKET
PENDULUM ROD
SIDE VIEW.
INSULATING WASHER
MAIN FRAME. FRONT VIEW.
STUD
CAP NUT.
TAPPED 4.B.A.
5/16" SQ
4.B.A. CLEARANCE
1/4" B.S.F.
3/16" C.S.

the top portions being drilled and tapped to accommodate them. The approximate positions are shown by the dotted circles on the drawing.

The lower section had three extra holes drilled at positions shown by "*A*," "*B*" and "*C*," two being drilled $\frac{3}{16}$ in. in diameter, and the other $\frac{1}{4}$ in. in diameter.

After the frame had been satisfactorily shaped up, the semicircular portions on the lower ends of the two side members (as shown by the dotted lines), were marked off to a radius of $\frac{5}{16}$ in. from the centres of holes *A*, *B* and *C*.

The lower portion of the frame was removed, the clearance-pieces cut and filed out, and the whole re-assembled.

Two $\frac{3}{16}$ in. diameter holes were also drilled in the unoccupied parts of each side member, and these were countersunk, as shown, to accommodate the fixing screws which eventually secured the main frame to the baseboard.

Pendulum Suspension Bracket

Both portions of this bracket were made from angle-iron $\frac{3}{16}$ in. in thickness, to the dimensions shown, and carefully filed up and finished true and square.

Care was taken to see that the hole for the screw to support suspension spring and pendulum, was drilled in the correct position to bring the centre-line of pendulum to a distance of $1\frac{1}{4}$ in. from the front surface of the *baseboard.*

This screw was a No. 4-B.A. cheese-headed set-screw, a tapped hole being provided in the left-hand portion of bracket, and a clearance hole in the right-hand portion.

The bracket was secured to the main frame by means of two No. 2-B.A. countersunk set-screws, suitable holes being provided, drilled and tapped right through the top portion of the main frame.

The top side of the bracket was fixed about $\frac{1}{16}$ in. lower than the top of main frame.

Contact Maker Pillars

These were made from $\frac{5}{16}$-in. square brass rod, set up in the four-jaw chuck, and a portion $\frac{3}{16}$ in. diameter by 5/32 in. in length turned on the lower ends. These were drilled up at the same time for a distance of $\frac{1}{2}$ in. and tapped No. 4 B.A.

They were then placed the other way round in the chuck and the ends slightly rounded, two being finished to a length of $1\frac{9}{16}$ in., and the other to a length of $1\frac{1}{2}$ in., the turned down portion being extra to these measurements.

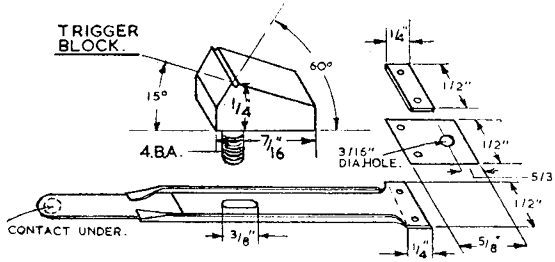
The short one which was going to be the adjustable contact support (*B*) was then drilled and tapped for a No. 2-B.A. contact screw as shown, at a distance of $1\frac{1}{4}$ in. from the base.

The pillar (*A*) was drilled with a $\frac{1}{8}$ in. diameter hole at a distance of $1\frac{5}{16}$ in. from the base, and 1/32 in. off centre, to give a longer threaded portion to the No. 4-B.A. set-screw, which was drilled and tapped at right angles to, and into, the first mentioned hole.

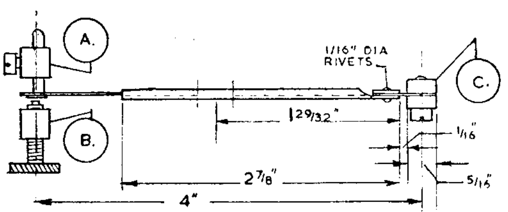
Pillar (*C*) had a piece $\frac{1}{2}$ in. long sawn out of the top end, and was then filed up carefully, leaving half its thickness, and a new piece was made to fit properly into the cut-away portion.

This was then sweated in position and a clearance hole for No. 4 B.A. drilled through both portions at a distance of $1\frac{5}{16}$ in. from the base of pillar, and after unsweating, the small portion was tapped for No. 4 B.A. and the corresponding hole in the pillar was opened out to the clearance size for same.

The pillars were now fitted to their positions in the main frame.



CONTACT SPRING ASSEMBLY.



Pillars (*A*) and (*C*) were placed in their respective holes and secured tightly in position by means of No. 4-B.A. set-screws and metal washers from underneath.

Pillar (*B*) had slightly different treatment, the $\frac{1}{4}$-in. hole in the main frame was bushed with an insulating bush made from fibre rod and having a bore $\frac{3}{16}$ in. in diameter, also two fibre washers were made, the top one having a $\frac{3}{16}$ in. diameter hole, and the underneath one having a No. 4 B.A. clearance hole.

The turned down portion of the pillar was fitted through the hole in the washer with the largest bore, and also into the fibre bush, the other fibre washer being placed underneath, together with a metal washer and No. 4-B.A. set-screw, and the whole tightened up. This insulated pillar (*B*) from the main frame.

A contact screw was turned up from brass rod with a knurled head, and was threaded No. 2 B.A. for a distance of $\frac{5}{8}$ in.

The threaded end was drilled up for a short distance and a contact which did service at one time on an old trembler coil was fitted and sweated in place.

This adjustable contact was screwed into the hole prepared for it in pillar (*B*) and was provided with a brass nut for locking purposes.

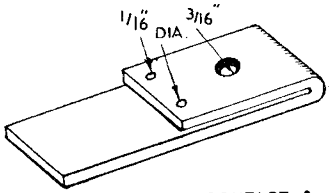
The $\frac{1}{8}$-in. hole in pillar (*A*) was provided with a piece of silver-steel $\frac{1}{8}$ in. in diameter and $\frac{3}{4}$ in. long, and a short No. 4-B.A. set-screw was fitted to the tapped hole, to lock same in position.

Contact Spring Assembly

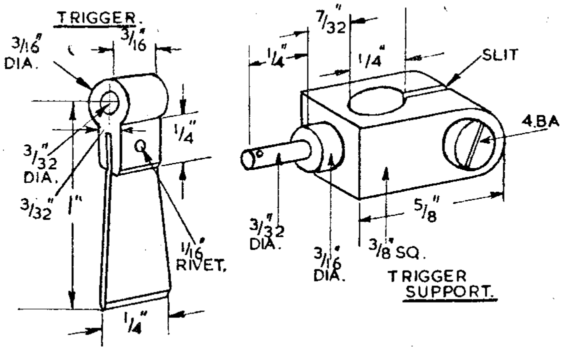
The contact spring assembly was built up from three pieces, the centre portion made from a piece of flat mild-steel $2\frac{7}{8}$ in. long by $\frac{1}{2}$ in. wide and 0.030 in. thick. This was gripped centrally, lengthwise between two pieces of $\frac{5}{16}$-in. square silver-steel, and the overhanging portions at each side were then hammered over at right angles, except the $\frac{1}{4}$ in. length at the right-hand end, as shown on the drawing.

This formed a little trough $\frac{5}{16}$ in. wide, with a flat portion $\frac{1}{2}$ in. wide at one end, and a slot was drilled and filed out to clear a No. 4-B.A. thread, the slot being $\frac{3}{8}$ in. long and at a distance of 1 29/32 in. from the flat end to centre of slot.

The spring carrying the silver contact was made from a piece of clock spring 0.012 in. thick by $\frac{5}{16}$ in. wide, and was gripped in the left-hand side of centre section by the two sides of the trough being hammered over the spring, as shown



PUNCHING JIG FOR CONTACT & SUSPENSION SPRINGS.



on the drawing. The spring had been previously cleaned, so that both it and the centre section could be sweated together to ensure a good electrical contact.

The spring supporting the contact assembly was made from 0.006-in. feeler blade $\frac{1}{2}$ in. wide, and this was made $\frac{5}{8}$ in. long when finished, the holes being punched in the positions shown, by the following method.

A piece of mild-steel $\frac{1}{2}$ in. wide and $\frac{1}{16}$ in. thick was bent over and hammered down on to a piece of material about 0.008 in. thick, holes $\frac{3}{16}$ in. and $\frac{1}{16}$ in. in diameter being drilled right through in the correct positions. The interleaving material was then withdrawn, and punches were made using quite a short length of round silver-steel $\frac{3}{16}$ in. in diameter for the larger hole, and for the $\frac{1}{16}$-in. holes a piece of $\frac{3}{16}$-in. diameter steel was drilled up for about $\frac{1}{4}$ in. with a $\frac{1}{16}$-in. drill, and a short length of $\frac{1}{16}$-in. diameter silver-steel was drivenin, Theend of this was hardened and ground off true.

The feeler blade was then inserted in the place of the previous interleaving material and was clamped to the flat portion, when, by means of the punches and a light hammer, the required holes were punched out. This method gave a nice clean hole, and then by opening the jig slightly with a screwdriver or similar implement it was used again to punch the $\frac{1}{16}$-in. holes in the centre section, and also in the small piece which goes uppermost.

The piece of feeler blade after cutting to length was riveted in position on top of the centre section, with the small piece on top of it, using $\frac{1}{16}$-in. diameter rivets.

The riveted end of spring was also sweated to centre section to ensure a good electrical contact, care being taken to thoroughly clean all soldering flux from the assembly.

When the contact assembly had progressed so far, the top of the trough was filed off true, and was reduced to leave the trough about 1/32 in. deep, and was cleaned up and polished all over.

The assembly was then tried in position on pillar (*C*), only $\frac{1}{16}$ in. length of the supporting spring being in action as shown, and the fixing-screw being properly tightened up, seeing that all was square and that the contact spring came centrally over the adjustable contact.

This spring had been left longer than necessary, and the point where the adjustable contact touched it was marked off. The assembly was then removed, and a piece of silver about $\frac{3}{16}$ in. square was soldered on the underside of spring, and the end of the spring trimmed off, rounded, and to length.

The assembly was refitted in its position, and this completed the work on the main frame of the clock with the exception of the trigger block, about to be described.

Trigger Block

This was made from a piece of $\frac{5}{16}$-in. square silver-steel, and was obviously a good sliding fit in the centre of contact assembly. It was made $\frac{7}{16}$ in. long by $\frac{1}{4}$ in. high at the highest point, this point being about 5/32 in. from the left-hand side.

The top was finished approximately to angles shown on the drawing, and a small vee-groove was filed where the two angles met at the top. Actually the groove was filed in the first place, and the angles carefully filed up to it, leaving a groove just under 1/32 in. deep.

In the centre of the base a hole was drilled, directly below the groove above, and was tapped out No. 4 B.A., care being taken not to drill it too far and foul the groove, etc.

The block was then hardened, and was carefully finished off with an oilstone on the angular surfaces, and also the vee-groove was polished at the same time.

A small No. 4-B.A. stud was then screwed tightly into the base of the block, and was provided with a brass nut and washer.

(To be continued)

IN THE WORKSHOP

by "Duplex"

55—Workshop Drawings

ALTHOUGH for simple work, drawings can often be dispensed with by marking-out the dimensions in the first instance directly on the work itself, nevertheless, mechanical drawings may be required either as a permanent record of design or to illustrate material for publication.

Drawings have the further advantage that they can be used to convey nearly all the necessary workshop information for constructional work in a very concise and exact form, whereas written or verbal descriptions may suffer from ambiguity or lack of clarity.

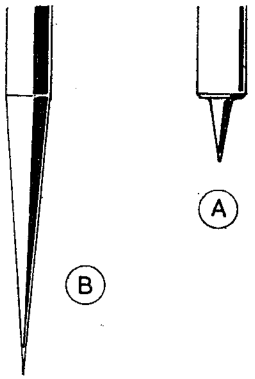


Fig. 1. *The two forms of compass needle*

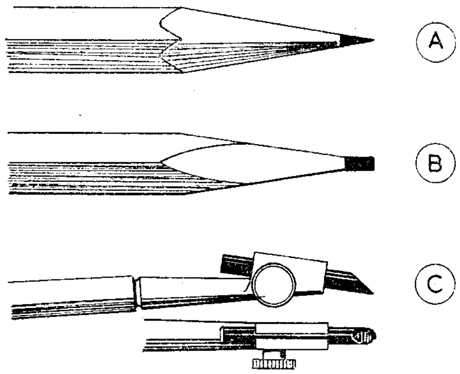


Fig. 2. *Three forms of pencil point*

In the first place, the drawing should show the worker what the object looks like ; this is termed a general arrangement drawing, and when a flat or two-dimensional drawing is made, three drawings, showing the top, side, and end views, will be required to give a complete representation of the object, thus leaving the worker the task of combining the three views to arrive at the correct mental picture.

The latter difficulty can be overcome by using a three-dimensional or isometric form of drawing which gives a clear and readily understood picture of the object just as does a photograph.

It is customary, for convenience of working, to indicate the component parts of a mechanism, shown in a general arrangement drawing, either by name or by using numbers. These numbers are then used in all subsequent detail drawings, so that any particular part can be identified and its relation to the other parts readily determined.

The general arrangement drawing is followed by a set of working drawings which indicate the exact dimensions, as well as the location of all bolt holes, of the individual parts.

Drawing Instruments

To begin with, a small set of drawing instruments will be required ; these can be few in number, but should be of the best quality. The minimum kit of instruments will consist of a compass with interchangeable pencil and ink points, and an extension leg which enables large diameter circles to be drawn. Two spring bows, which are essential for drawing small circles, will be required, and one for pencil and another for ink should be obtained. As an addition, a pump centre compass should be purchased, as this form is invaluable for drawing very small circles ; its range, however, is limited, so that it cannot entirely take the place of the spring bows.

Finally, a pair of dividers for pricking-off measurements and a drawing pen for inking-in will be required.

The compass, the spring bows and dividers should be fitted with needle points, as these, when used repeatedly in the same centre, do not make a large hole in the drawing. Needle points are made in two forms. That shown in Fig. 1*B* is pointed like a household needle, and for some purposes resembles the gramophone variety. The other form, depicted in Fig. 1*A* is ground to form a shoulder which prevents the point sinking more than a limited depth into the drawing paper and board.

A set of drawing instruments which contains all the essentials, and uses needle points of the type referred to in the previous paragraph, is the Lee Guiness S.102. This set contains :—

A 6½ in. Compass with Compass Pen, Knee Jointed Needle Pivot Leg, and two extension legs.

A 4 in. Spring Bow Pen with Centre Wheel Adjustment.

A 4 in. Spring Bow Pencil with Centre Wheel Adjustment.

A 5 in. Spring Nib Ruling Pen.

A refill case containing spare leads and needles.

A Compass Head Key.

The instruments themselves are made in silver bronze, and the workmanship, as shown by the fit of the interchangeable parts and such minor matters as the sharpness of the knurling on the finger nuts and wheels, is of a very high order. The instruments themselves are contained in a neat and practical case measuring 9¼ in. long by 3⅝ in. wide by ⅞ in. thick.

The capacity of the instruments is as set out below :—

	Circles up to :
Compass without extension leg ..	15 in. dia.
,, with 1st ,, ,, ..	21 in. ,,
,, ,, 2nd ,, ,, added to 1st	30 in. ,,
Pencil Bow	2¼ in. ,,
Pen ,, ...	2¼ in. ,,

These readings were taken with the instruments in moderate and not in unduly extended settings. The smallest circle which the spring bows will draw cleanly is one of $\frac{1}{16}$ in. diameter.

By courtesy of Messrs. Buck & Ryan Ltd., of Euston Road, London, N.W.1. we have been enabled to test this set, and can thoroughly recommend it to all those who are prepared to pay a fair price for instruments which will last them for the rest of their life.

To begin with, a standard drawing-board and T-square may be used in conjunction with set-squares having 45 deg. and 60 deg. angles. Nevertheless, it is recommended that the pantographic type of draughting machine should be used. Such machines are most convenient to use and greatly superior to the ordinary drawing-board. The construction of simple draughting machines presents little difficulty and several good designs have appeared in THE MODEL ENGINEER from time to time.

In general, these machines were planned for use with small size paper, since the drawings for most amateur work do not need to be large. Quarto paper, 10 in. × 8 in., is a most convenient size, and the drawings illustrating this series of articles are almost invariably made on paper of these dimensions. On the rare occasions when a larger area of paper is needed, it can usually be obtained by gumming two sheets together. Supplies of quarto paper are readily bought, since this is a normal size for use in the typewriter, and any make of a good quality is excellent for both pen and pencil work.

Pencils

Pencils should be of best quality and hard grade, 4H being the most suitable. Two forms of pencil point may be used. In the first form, shown in Fig. 2*A*, the point is sharpened in the manner used when the pencil is intended for writing purposes, whilst in the second form, Fig. 2*B*, the pencil is trimmed to a chisel point. This latter style is to be preferred, as it facilitates subsequent sharpening of the point on a sand-paper block. Sharpening is carried out by holding the pencil against the block and moving it backwards and forward in the manner used when putting an edge on a chisel as shown in Fig. 3. The angle at which the pencil should be held is similar to that of the knife cuts made in the initial sharpening. A hard pencil carefully sharpened in this way will give prolonged service before it is again necessary to trim it with a knife.

The leads used in pencil compasses and bows are sharpened in a similar manner to the shape shown in Fig. 2*C*.

Ink

Indian ink must be used for all drawings intended for publication, its intense blackness being an essential requirement of good block-making. The make recommended is Winsor & Newton's Mandarin indian ink, which may be diluted with either distilled or rain water when required. If, for any reason, a blackness of greater intensity is needed, Winsor & Newton's fixed indian ink should be used. No attempt, however, should be made to dilute this ink with water, as experience has shown that it is spoilt by so doing.

Coloured inks have no place on drawings intended for reproduction by simple processes, but may be used with advantage when the original drawing is to be used for exhibition purposes. All manufacturers list a comprehensive range of colours which may be used for drawing centre-lines as well as tinting sectional drawings to denote the different materials of which the mechanism as a whole is composed.

One particular ink calls for special mention. This is the so-called white ink, which is in reality a solution of chinese white, or process white, in water to which a fixative is added. This ink is mainly used for obliterating unwanted black lines, or blemishes caused by smudging, and it may be applied with either a brush or a drawing pen. When used in the latter instrument, it is possible to make neat corrections in even the most cramped spaces. In passing, it should be noted that, when large areas of drawing require to be obliterated, paper should be pasted over the unwanted part. Any re-drawing needed can then be made on this paper.

A further use for white ink is in connection with photographic illustrations. It is often necessary to draw identification arrows directly on the photograph. When the background is white or light coloured, these arrows may be made with black indian ink, but with a dark or black background it is obvious that black ink will not show, and it is in such cases that white ink must be used. Sometimes the arrows have to cross areas which are alternately dark and light. In these circumstances both black and white inks must be used, black on light areas, and white on dark. Before making any ink lines on a photograph, one should breathe heavily on it, as this promotes a free flow of ink. This point is of particular importance with glazed prints, which are the best from the blockmaker's point of view, for the ink must flow without breaks at the first stroke of the pen. Repeated strokes tend to damage the surface and cause smudging.

Two sorts of rubber will be needed, one for the erasing of unwanted pencil lines when corrections to the drawing are made, the other for cleaning up the drawings after they have been inked in.

For use in the former case, one of the many makes of "art gum" is very suitable, as they do not destroy the surface of the paper particularly when used with an erasing mask, which is essential when using a rubber.

The cleaning of drawings is best carried out with an artist's cleaning eraser, which is a large piece of soft rubber having light erasive properties.

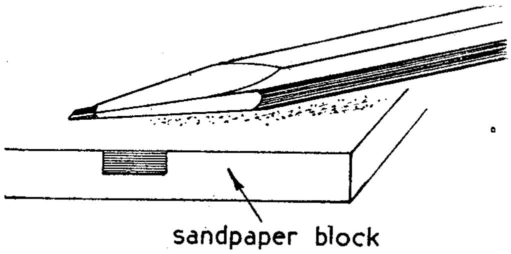


Fig. 3. Sharpening a pencil on a sandpaper block

Rules with the usual graduations down to 1/32 in. will be required for the transfer of dimensions to drawings. In the end, the best quality are the cheapest. The range is extensive, and at one time boxwood rules were considered superior to other varieties. Nowadays, white erinoid rules are obtainable and these have the merit of greater legibility, but care should be taken in selection to see that the engraving is of good quality, for, in some of the cheaper forms, cleaning the rule is apt to erase the engraving.

Those who eventually make a draughting machine for their own use will find that its usefulness is enhanced by attaching rules to both the horizontal and vertical limbs of the draughting-head. In this position they may be used for direct measurement and the same time they are well placed for setting the dividers when transferring dimensions to the drawing.

Sets of scales having a comprehensive range are obtainable but are not essential for making the drawings usually required in the workshop. When it does become necessary to make a drawing to an enlarged scale, or to make it to fit the paper, the problem can be solved by simple arithmetic. Usually, scale drawings are made either half full size or twice full size, and there is, therefore, little difficulty in calculating the necessary dimensions.

Additional Equipment

Most drawings contain representations of screw threads, and unless special provision is made, the drawing of these will entail the re-setting of an adjustable set-square where such is in use on the ordinary drawing-board, or will involve setting over the protractor head when a draughting machine is being employed. To avoid this, and also to promote rapidity in working, a small angular square, as shown in Fig. 4*A*, should be made. This will enable both left- and right-hand threads to be drawn. The angle at which threads are usually depicted on a drawing is 3 deg., so the opposite edges of the square are each planed to form an angle of 87 deg. with the base. The device may be made from either celluloid or a suitable plastic material about 3/32 in. in thickness, and the angular edges must be bevelled so that the square may be used with a drawing pen. A similar form of square may be made for use when drawing chamfers on ends of shafts or elsewhere, this is shown in Fig. 4*B*.

Care and Maintenance of Equipment

Good service cannot be expected from drawing equipment unless this is properly maintained. Drawing instruments need the best of care, for they are both expensive and delicate. The joints of compasses and dividers must always be kept in proper adjustment or difficulty will be experienced in making settings. If the joints are too slack, the setting will almost certainly alter, whilst undue stiffness will make the instruments troublesome to use.

The lubrication of drawing instruments must be done with discretion and oil applied sparingly to joints and adjusting screws, any surplus lubricant being carefully wiped away before use.

As with any other tool, cleanliness is of the greatest importance. A piece of wash-leather should, therefore, be kept for wiping the instruments after use, for a set which has been allowed to become stained and discoloured is no credit to any draughtsman.

Drawing-pens and the ink points of compasses need to be wiped continually, otherwise the ink, which dries rapidly when the pen is not actually being used, will stop flowing. Furthermore, if this drying is allowed to occur often it will lead to the formation of an accretion of hard ink, and the pen will then need to be cleaned by means of a special chemical preparation. Experience has shown that this cleaner does not improve the subsequent action of the pen, for it removes all traces of ink and this is not desirable. There should always be a film of dry ink present on the nibs to allow the pen to work smoothly.

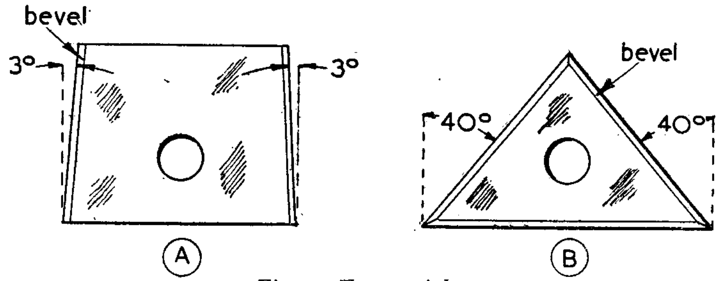


Fig. 4. Two special squares

Sharpening Drawing Pens

After prolonged use, flats, caused by the abrasive action of the paper, will form on the pen nibs, and this will result in an inability to draw fine lines. The pen will then need sharpening. We have described fully, in a book entitled

Sharpening Small Tools, which is published by Percival Marshall & Co. Ltd., the procedure which is necessary, but it will not be out of place to repeat the instructions briefly.

The nibs of the pen, when viewed from the side, should have rounded tips which are reduced to a thin edge when seen from their other aspect. The first step, therefore, is to restore the rounded form to the tips. This is done by closing the nibs together with their adjustment-screw, and working the pen, held vertically in the hand, on a fine oilstone. The pen is worked with a rocking motion which will cause the tip to assume the required curved form.

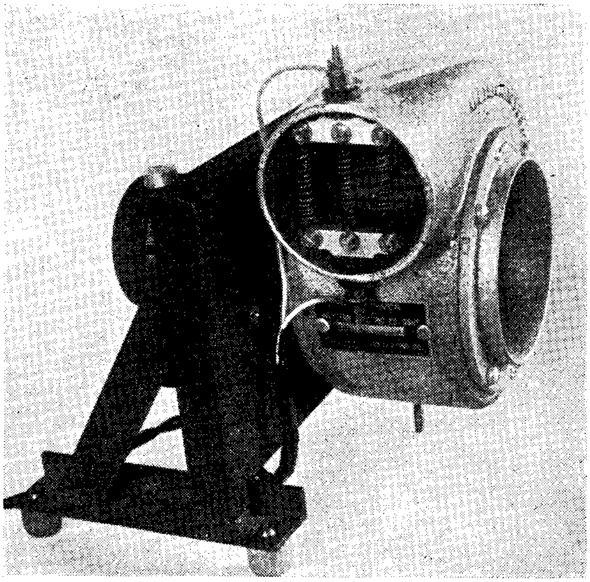


Fig. 5. Hot air blower for drying ink drawings

The next step is to thin the tips, applying an oilstone slip to their outer faces only. A magnifying glass should be used to observe the progress made and to ensure that the oilstoning is being carried out evenly.

When the nibs have been thinned sufficiently, they are then separated and any small burr which may have formed on their inner faces is removed with the slip.

Finally, the nibs are again closed and are rubbed with a piece of hard steel to burnish them. A drawing pen should be sharp, but not sharp enough to cut the surface of the drawing paper. The burnishing operation, however, will prevent this.

Drawing-boards, T-squares and set-squares must be kept clean, dry and free from dust, and should be put away carefully when not in use. The same remarks apply to draughting machines, for dust and dirt will cause wear to take place at the pantograph arm joints and at the protractor head.

Artificial Drying of Drawings

When drawings are being inked in, it is tiresome, and time wasting, to be forced to wait for the ink to dry by natural means. Commercial drawing offices make use of artificial methods to accelerate the drying process, and frequently employ a domestic hair dryer for the purpose. Now hair dryers are somewhat expensive, and as all that is required is a steady stream of warm air, it is not difficult to construct the necessary apparatus from surplus military equipment. We, ourselves, have made the device shown in Fig. 5 from one of the surplus electric motor-driven blowers which may be obtained. This machine, which is powered with a 27-V d.c. Western Electric motor will run equally well on alternating current, so, since it is also possible to obtain suitable transformers for operating from the 230-V main supply, there appears to be no lack of the essential equipment.

The transformer we use is wound for an input of 230-V a.c. and an output of 500 W at 20 V. The applied voltage to the motor is, therefore, considerably less than that for which it was originally designed, as a result the blower runs comparatively slowly, and quietly, delivering the steady stream of air which is desirable for drying purposes. The outlet from the blower casing is 2¼ in. diameter which is amply large to allow the heater element to be mounted in it. As will be seen from the illustration, Fig. 5, the element consists of three coils; these are wound with No. 28 s.w.g. resistance wire and are connected in parallel. Originally it had been decided to run the blower direct from the 230-V mains, using a 250-W element both as a heater and as a resistance in series with the motor itself. But doubts as to the insulation of the machine being adequate for a high voltage led us to decide on running the motor at 20 V, and, there being ample power available, to feed the heater from the same source of supply. Tables are published giving data from which any required heating element may be calculated, but these only cover the performance in still air. However, with their aid, the requisite wire length when in coiled form was found. In still air the element heated up to the desired temperature, but on running the blower it was found to cool unduly, so coils were removed from each of the three wire spirals until, with the blower running, the element gave sufficient heat.

Each spiral now consists of 13 coils 0.240 in. diameter No. 28 s.w.g. At present the current consumption is of a high order, though within the capacity of the transformer.

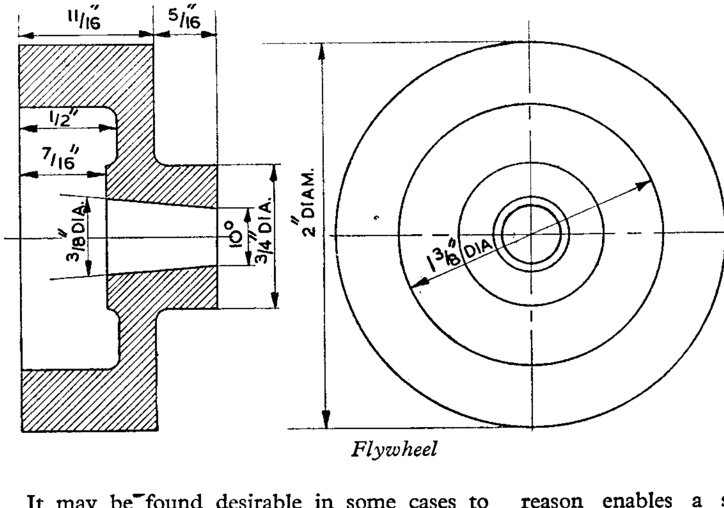
The blower unit is supplied complete with a fabricated light alloy stand and mounted with its outlet facing downward By removing four screws the unit may be turned through 90 deg. to allow the outlet to face horizontally when the mounting rests on the table.

(To be continued)

*UTILITY STEAM ENGINES

by Edgar T. Westbury

THE flywheel for the "Venturer" engine is specified as being made in cast-iron, but mild-steel, brass or gunmetal are equally suitable if more readily available. Instructions for machining flywheels have been given on several occasions in connection with the construction of both steam and i.c. engines, and there are several methods which are quite satisfactory, the main essential being to ensure that when finished, the flywheel runs truly on its shaft. Although this would seem to be the most straightforward job in the world, it is only too common to see flywheels wobbling badly—a horrid sight to any conscientious engineer. To reiterate advice which I have given many times before, I recommend chucking the flywheel by the back rim, either inside or outside, and roughing out as much of the outside as is accessible, to within $\frac{1}{16}$ in., or less, of finished size. Then reverse in the chuck, and machine the back, and all other parts not previously dealt with, working to the finished sizes in this case, and at the same time drilling and boring the tapered hole in the centre. Finally, mount the bore on a true tapered mandrel and finish the rest of the surface.

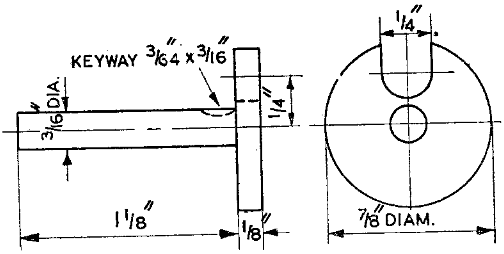


Flywheel

It may be found desirable in some cases to modify the shape of the flywheel, as, for instance, to enable some particular form of coupling to be fitted. Engines intended to run at high speed should *never* have the flywheels secured to the shaft by cross pins or grub-screws—not even that very efficient but overworked device, the Allen screw—because whereas these methods may be quite adequate to deal with any normal driving torque likely to be encountered, they are not equal to withstanding the inertia forces set up during the acceleration and deceleration of a heavy flywheel. Even a properly fitted sunk key may prove to be inadequate in these circumstances unless used in conjunction with a good taper fit, and sheared or, worse still, distorted keys are not uncommon in practice.

Flywheel Collet

This follows the principles used for flywheel mounting in many of my steam and i.c. engines,



Follower cranks

and I am often asked to justify my use of this method, which seems unduly complicated to some constructors. Well, it is mainly a matter of experience—having tried practically all ways, I have found this to be the most satisfactory—but there are, of course, quite logical reasons why this should be so. First of all, it avoids undue weakening of the end of the shaft, such as would be involved by turning a taper direct on the latter, and for the same reason enables a substantial-sized thread to be used to take the securing nut. It also gives a large bearing surface for the flywheel, ensuring true running if properly made, and gripping firmly and resiliently inside and out; while in the unlikely event of the tapered surfaces becoming damaged, it can easily be renewed, using an oversize collet if it is necessary to rebore the flywheel boss.

It may be noted that in the original version of this engine, illustrated on page 757 of the December 15th issue, the shaft was not reduced in size at all at the flywheel end, and the collet

*Continued from page 57, "M.E.," January 12, 1950.

was provided with a screwed extension to take the draw-nut. This is, perhaps, the most robust form of the collet fixing, affording the maximum effective size of both the shaft and the thread; but its practical disadvantage is that it has no positive end location, and should the flywheel be removed for any reason, it will generally be found necessary to dismantle the engine when refitting it, in order to ensure that the end play between the main bearing and the collet is taken up. In the later form of the engine, the shaft is reduced slightly, thus producing a location shoulder for the collet, which is drawn up to it by a nut on the shaft itself. But the arrangement is, of course, optional, and some constructors may prefer the earlier type.

The extraction of flywheels fitted in this way is no more difficult than in cases where they are fitted to a tapered shaft, but it should be remembered that the correct place to apply the counterforce (whether by a screw extractor or the good old-fashioned hide mallet) is on the end of the collet, and it may be found necessary to make a sleeve or hollow punch to bear on this point. Screwing the flywheel boss to take an extractor cap, or providing tapped holes in its face for a similar purpose, are prudent measures which can be thoroughly recommended, and the only reason why I do not specify them in basic designs is because of the need to keep these down to their simplest essentials. If I show provision on the flywheel for fitting the extractor, and do not illustrate the latter in detail, I am sure to have to atone for my sins of omission by answering innumerable queries on the subject.

Follower Crank

The function of this component is to transmit the drive from the main crankpin to the camshaft spur gearing, and also provide an external shaft for driving any auxiliary plant, such as feed or oil pumps, which may be located at the timing end of the engine. It is best machined from a solid piece of mild-steel, which must be large enough to clean up to $\frac{7}{8}$ in. diameter, and in some cases it may be found desirable to make the shank longer than is shown here. The slot in the disc may be cut either by end-milling, or by drilling, sawing and filing; its width should be just sufficient to fit over the crankpin without perceptible play, and its depth sufficient to avoid any suspicion of binding or forcing the crankpin outwards when the shafts are assembled. Case-hardening of the entire component is an advantage, if it can be done without distortion, but is not essential for moderate duty engines.

As the spur gear for driving the camshaft cannot be pinned or grub-screwed to the shaft, a keyway is desirable, but I have found that an effective substitute is to knurl the shaft with a straight-cut wheel (N.B.—This should not be regarded as a substitute for good fitting!) before pressing the gear wheel on.

Valves should be made of stainless-steel, if it can be obtained, but the stems of some motor-car valves are made of a corrosion-resisting steel (one can easily tell, if they are obtained from an open-air scrap heap!) and will thus provide suitable material. The valves should be turned at one setting by reducing the ends to size first, and bevelling them so that they can be supported by a hollow centre in the tailstock. As in the case of the "Spartan" engine, the portion of the stem which works in the guide must be a very close fit, and should be machined to within about 0.001 in. of finished size, and then lapped to exact size. The seating faces should be turned to an included angle of 90 deg., and machine-finished as highly as possible with a keen round-nosed tool.

Special nuts, having a collar to locate the springs, are made to fit the threaded ends of the valves—use a tailstock die-holder to cut these threads, by the way—and these are backed up by standard lock-nuts. Note that the special nuts have enlarged hexagons, which will facilitate adjustment, quite an easy operation if one uses Terry spanners of appropriate sizes, but it will be advisable to slot the valve heads, to enable them to be held from turning, by means of a screwdriver.

Tappets

It is not necessary to turn the outsides of these if they are made from $\frac{1}{2}$-in. bright mild-steel rod which is ascertained to fit closely in the tappet guides. Drill up the centre 5/32 in. diameter and finish the end of the hole with an old drill ground to cut flat, or a D-bit, to eliminate unwanted weight. Finally, case-harden the tappets all over, and polish on the end face and outside diameter. The end faces must be dead flat.

Suitable valve springs may usually be found in the assorted lots sold for the use of jobbing engineers, but they are not difficult to wind as and when required. A very important point is that the end faces should be finished truly, an operation usually carried out by presenting them squarely to the side of a grinding wheel, allowing the end turns to heat up and bend into place. When the engine is new, and the valves slightly tight in the guides, strong spring tension may be necessary to avoid sticking, and it is often possible to use weaker springs afterwards, or slightly ease the original ones by reducing their length by a turn or so.

Camshaft

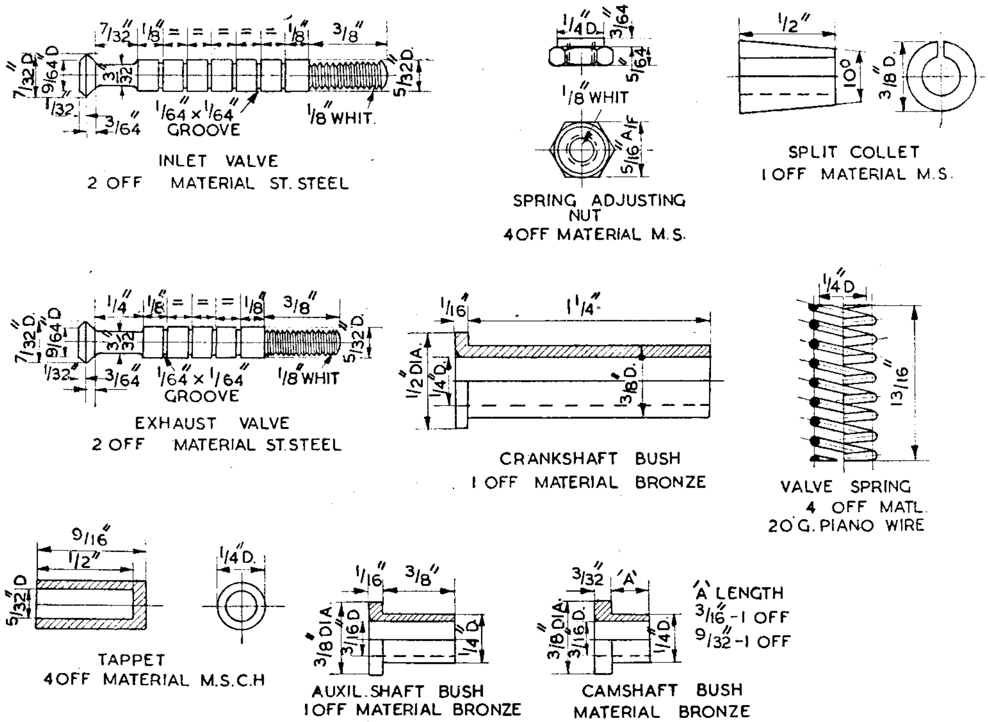
Perhaps the greatest deterrent to the use of poppet valves in steam engines is the fact that cams have to be used; these innocent-looking objects are regarded with fear and suspicion by many otherwise competent engineers. Perhaps, however, there is good reason for this, when one considers what an awful job of designing cams has often been perpetrated by those who ought to know better—and, of course, the equally grim results obtained therewith. But really there is nothing to be afraid of, either in designing or producing cams, and the fact that builders of four-stroke petrol engines have been forced by necessity to get down to this job has resulted in accumulating a certain amount of data on the subject.

In accordance with my usual practice, I have designed these cams to be made by the simplest possible methods, without sacrifice of accuracy or efficiency. While it is not impossible to produce reasonably good cams by hand-filing

alone, it takes a considerable amount of skill to ensure accuracy in this way, and I prefer to rely on the positive accuracy obtainable by machining. Again, one could make the cams separate from the shaft, and pin them in position after locating the timing, but this involves the double problem of making an accurate cam, and then putting it exactly in the right place, whereas both problems are dealt with simultaneously by machining from the solid.

drilled and tapped in the ends to take the clamping-screws, those for holding the camshaft being of brass, and flat-ended, to avoid bruising the finished surface, but those holding the mandrel may be of steel, and are pointed, so as to locate in "dimples" drilled in the mandrel.

A simple form of division plate is also required, the one shown being simply a disc of brass, 1 in. diameter, held on the camshaft by means of a sunk brass grub-screw, the position of which



INLET VALVE
2 OFF MATERIAL ST. STEEL

SPRING ADJUSTING NUT
4 OFF MATERIAL M.S.

SPLIT COLLET
1 OFF MATERIAL M.S.

EXHAUST VALVE
2 OFF MATERIAL ST. STEEL

CRANKSHAFT BUSH
1 OFF MATERIAL BRONZE

VALVE SPRING
4 OFF MATL. 20 G. PIANO WIRE

TAPPET
4 OFF MATERIAL M.S.C.H

AUXIL. SHAFT BUSH
1 OFF MATERIAL BRONZE

CAMSHAFT BUSH
MATERIAL BRONZE

The camshaft is first turned between centres, leaving the blanks for forming the cams $\frac{3}{8}$ in. diameter, and finishing other parts to correct dimensions, including the journals and the spur-gear seating, which should be a good press fit in the bore of the gear. A simple jig should now be made to carry the complete camshaft so that it can revolve eccentrically between the lathe centres, for the purpose of forming the flank contours of the two cams.

Cam Turning Jig

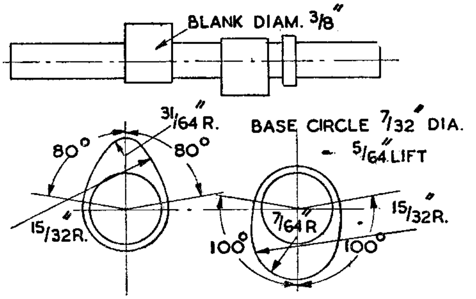
As shown in the drawing, this jig comprises a mandrel, centred at each end, and two square or rectangular bars which form throw-pieces to hold the camshaft at the specified radius, which in this case is 23/64 in. between the mandrel and camshaft axes. The mandrel may be made from a piece of $\frac{1}{4}$-in. round silver-steel, about $1\frac{3}{4}$ in. long, and the throw-pieces from either steel or brass bar, $\frac{3}{8}$ in. $\times$ $\frac{1}{4}$ in. $\times$ $\frac{7}{8}$ in. long. It is a good policy to sweat the two pieces together for drilling the two main holes, which should preferably be done by setting them up in the lathe, so as to ensure that they are exactly parallel and in axial alignment. Holes are then

is immaterial, so long as it can be arranged not to foul the lathe centre in either of the machining positions. Two holes are drilled in the disc at exactly the same radius as those in the throw-pieces, and spaced 160 + 200 deg. apart—that is, assuming the one at the bottom to be on the vertical centre-line, that at the top is displaced 20 deg. on either side of the line. To ensure correct radial position, the flat face of the disc should be marked out (using the lathe mandrel and a simple indexing fixture, if possible) and spotting the holes from the $\frac{1}{4}$-in. hole in the throw-pieces, using a piece of $\frac{3}{16}$-in. rod in the other hole to locate the disc centre. The two holes, when drilled, are deeply countersunk from the boss side, so as to register with the centre in the end of the mandrel, and when the latter is set up for machining, the lathe centre will serve as an indexing pin.

The division plate should be a light press fit on the camshaft, so that it does not need much holding in place, as it is most important that no relative movement of the plate and the shaft, when once machining is started. Cutting torque is resisted by the clamping-screws in the throw-pieces, which must, of course, be loosened for

setting the camshaft to the correct angle in each case. The only reason for making the boss of the disc conical is to give a good hold for the grub-screw, and also make it easier to drill and tap the hole at an angle.

It will be seen that the cams have been so designed that although the two cams are opposed to each other, and have different opening periods,



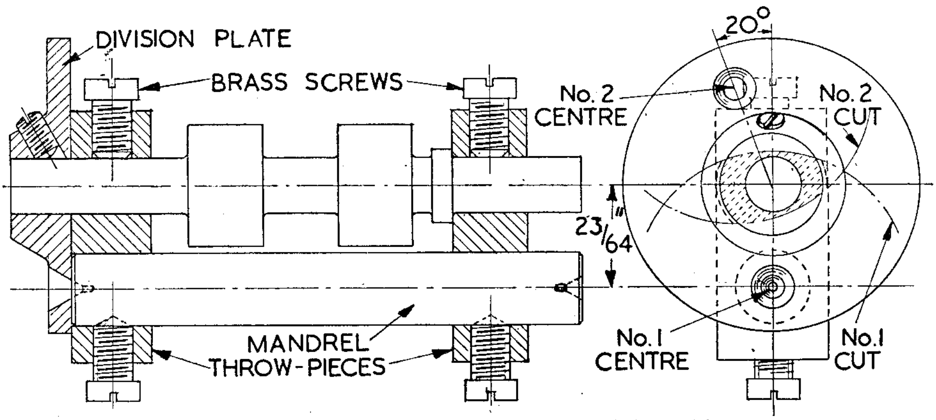
Crankshaft details (contours twice full size)

only two cuts are required to form both sets of flanks. When the shaft is set up in the jig and placed between centres, a narrow, keen and well-raked cutting tool is set in the tool-post, and the depth of cut is gauged by using the narrow collar on the camshaft as a "witness," the tool being fed in until it just touches this collar at the extreme throw of the shaft. Note the position on the cross-slide index, or alternatively, fit up an improvised index or a cross-slide stop to ensure that this depth of cut is uniformly attained. The lathe is then run at a cautious speed, and the two cam blanks eccentrically

At this stage it is a sound policy to mark the points of the cams distinctively, the steam admission cam being the narrow-pointed one (on the right in the dotted section), and as already mentioned, it is advisable to have this at the timing end, though this will be determined by what has already been decided with regard to the respective port locations in the cylinder-heads. A spot of quick-drying paint on each of the cam points will be the best way to distinguish them, say, red for steam and blue for exhaust, for instance.

Forming the Base Circle

The division plate may now be removed from the camshaft, and the latter indexed into various positions for turning away unwanted metal down to the base circle, to the stop or index mark, as previously determined. Here will be seen the wisdom of marking the cam points distinctively, as it is only too easy to make a mistake and cut away the business end of the cam unless this precaution is taken. It may be remarked that the technique recommended is exactly the same as that for the eight cams of the "Seal" 4-cylinder petrol engine, and many readers have reported success in carrying out this complicated operation, by the prescribed methods, so there is obviously nothing to boggle at in forming two diametrically-opposed cams in this engine. By taking a series of cuts at intervals of two or three degrees, the base circles can be formed sufficiently accurately so that they only need a touch of a dead smooth file to finish them; the noses of the cams can be rounded off by hand-filing, the important point here being to ensure an easy change of contours rather than working to exact dimensions.



Cam-turning jig, showing camshaft blank in position

machined away to the specified depth, taking light cuts so that there is no risk of the work shifting or the tool digging in.

Next, loosen the camshaft clamping-screws, and rotate the disc to line up the second hole with the mandrel centre; replace between the lathe centres, re-tighten the screws, and proceed to turn away both cam flanks as before. The shape of the blanks now is as indicated by the dotted section in the end view of the assembly.

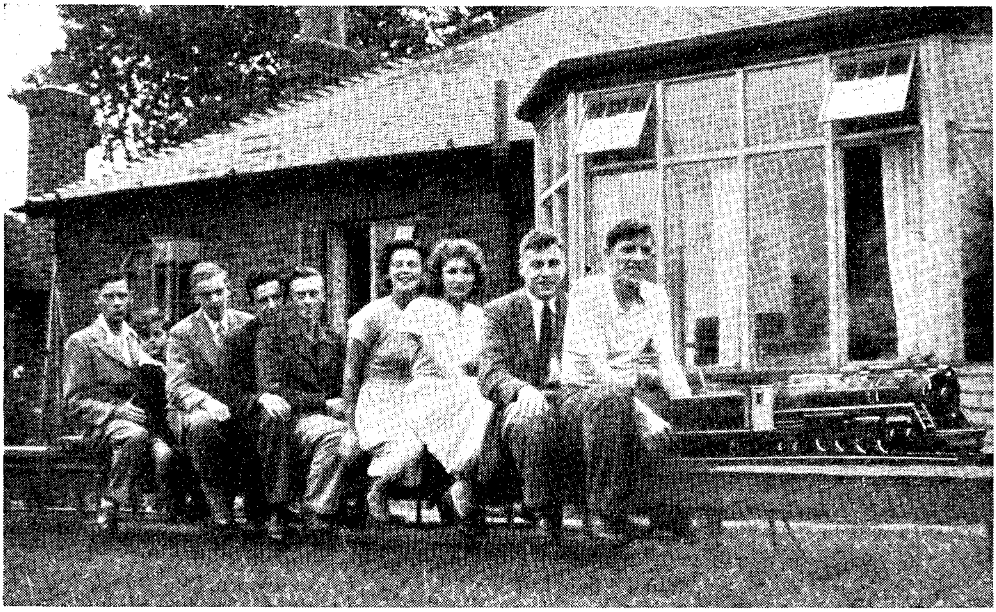
While it is desirable to case-harden the cams, it is not absolutely essential, as they work in conjunction with hardened tappets, and many readers may prefer to avoid the risk of distortion which this entails. Tests of an unhardened camshaft under heavy duty conditions show only a fairly uniform polishing of the cams on the flanks and noses, with no perceptible destructive wear.

(*To be continued*)

"L.B.S.C.'s" Lobby Chat

Roller-Bearing Slide Blocks

IF I deal with some of the points raised by recent correspondents in a bit of a "chinwag around the lobby stove," it may save other folks' time and ink; so here goes. Referring to my recent note about the fallacy of expecting a ball-bearing to roll on both sides of a slide at once, two or three readers have pointed out that no less a person than Henry Maudslay used bronze wheels in the crosshead of a vertical engine, instead of the usual slide blocks; and whilst agreeing with my statement that one side of the roller would of necessity slip, or both sides slide, ask for a possible explanation. I knew about Maudslay's engine; and the explanation is very simple. When a locomotive is running chimney first, the pressure between guide bars and block is always taken by the upper bar. When running tender or bunker first, the lower bar takes the strain. The reason is just this. Taking forward motion first; when the crank is on top centre, and the connecting-rod is pulling it, the piston-rod and connecting-rod try to pull into a straight line. All that prevents them doing so, is the slide block pressing against the top guide bar; there is no pressure on the bottom bar. When the crank is on the lower centre, and the connecting-rod is pushing at it, the tendency is for piston- and connecting-rods to double up like a pocket-knife, using the crosshead pin for a fulcrum; and again, it is only the restraint of the top bar on the slide block which prevents them doing so. The pressure is thus taken by the top bar on both inward and outward strokes of the piston-rod. Going backwards, the sequence is reversed; the "pull-out-straight" tendency is when the crank is on bottom centre, and the "double-up" effect on top centre, and it is the bottom bar which keeps the rods to the straight and narrow path.



An easy load for big cylinders! Mr. *Adams's* 2½*-in. gauge* 4-8-2

To the best of my recollection, the Maudslay engine ran only in one direction; therefore, all old man Henry had to do, was to arrange for his rollers or wheels to touch the appropriate guide bar according to the direction of rotation, and give the other one say a thousandth of an inch clearance. The rollers would then have run up and down one bar, and missed the other altogether, thus eliminating rubbing friction. Even if the rollers or wheels had touched both bars in the first place, a very short period of operation would have worn the necessary clearance for them to miss one bar. Followers of these notes who were interested in my "Vision of the Future" in the issue for July 14th, 1949, have asked how I managed the drive from the inside cylinders of the "simple-compound" to the crank axle, since by virtue of their large diameter, the said cylinder centres must obviously be much farther

apart than the crank centres. Messrs. Knowitall & Co. Unlimited, said it couldn't be done; well, that's all they know! I didn't write that yarn without actually designing the engines; in fact, I could describe a $3\frac{1}{2}$-in. gauge version of either the L. & N.W. 4-6-4, or the Caledonian 4-8-2—*and* the "Golden Arrow" super-flyer! Like everything else, the solution is absurdly simple—*when you know it.* The inside cylinders of the "simple compound" had alligator crossheads with a row of roller-bearings at top and bottom, instead of sliding shoes; and the little-ends of the connecting-rods were attached to overhanging crosshead pins—remember my design for old *Rainhill*?—each one having a whacking great roller-bearing, enclosed and grease lubricated, so that hot little-ends were relegated to limbo. If outside connecting-rods can drive satisfactorily on to overhanging crankpins in locomotive wheels, which they do in every outside-cylinder engine, notwithstanding the coupling-rod between the big-end and the wheel boss, there is no earthly reason why the drive should not be reversed in the case in point, an overhanging pin driving the rod. I also schemed out an alternative arrangement, with a large boss at the side of the crosshead, slotted to take the little-end, and thus providing for the crosshead pin to be supported at each side.

The good folk who are never happy unless they are trying to catch me out in some way or another, will probably chime in at this point, and say that the roller- or ball-bearing in the valve-gear slide shaft, would also run on one side and miss the other. It would do nothing of the kind, for the simple reason that the thrust reverses at each reversal of the valve. The bearing would slide, as I said, until sufficient wear took place for it to roll up one side and down the other; and it would be some roll at that, with flat places worn on the outer side of the bearing. Then it would start hammering away at top and bottom of the movement, at the point of reversal, and make a nobby mess of the slide-shaft, as the hammering would take place on little more than a line contact. Finally, the outer race would crack, and that would put the tin lid on the whole issue.

Tyres and Tool Marks

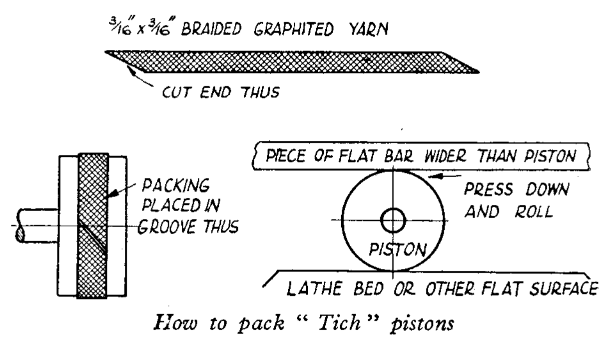
A correspondent who earns his daily bread at turning full-sized locomotive tyres, refers to a statement by another writer in this journal who claims to have a photograph of a locomotive, showing a tyre joint in the face of the wheel. Our friend says, why doesn't he refer to the drawings of the full-sized engine, which he also claims to have, and he will soon see where the joint really is. Incidentally, I thought of that myself, for I looked through all the drawings of full-sized locomotives which I have (plenty of them, too!) and all the tyres have smooth unbroken faces, the joint between tyre and centre being exactly as illustrated in my note on this subject some time ago. The tyre-turner says he can explain the apparent groove in the rim; it is nothing more than a deep scratch from the turning-tool. Tyres are turned on a horizontal faceplate by a huge square-ended tool which takes off the whole width of the face at one cut (I have seen this operation myself at Swindon and elsewhere) and precision finish is certainly not aimed at in these days of "anything-will-do-as-long-as-it-earns-money." The broad cutting edge of the tool soon becomes slightly jagged, or irregular, but as long as it will cut, it isn't reground; so that towards the end, it doesn't cut smoothly, but leaves the face of the tyre well lined, with plenty of projections or grooves in it. A deep groove might easily be mistaken by the uninitiated, for a joint between wheel centre and tyre.

Our friend is perfectly correct. Tyres are turned a whole heap rougher than in the days when Billy Stroudley was King of Brighton Works; and I have here at the present moment, several close-up photographs of the latest-type of locomotive turned out from Swindon Works, to wit the 1500 class 0-6-0 tank engine. One of these photographs shows the right-hand driving-wheel, with a deep scratch right in the middle of the tyre face, which a layman might easily mistake for a joint; and several minor scratches, giving the impression of a tyre built up from rings. The other two wheels have fairly smooth-faced tyres. Incidentally, when this engine first appeared, I started to get out some drawings of it, both for $3\frac{1}{2}$-in. and 5-in. gauge, and have some ready. I note one of our advertisers has got hold of the same idea, so I hasten to assure all and sundry, that the drawings he is advertising, are not my handiwork; though they may—and probably will—be in accordance with the gospel I have preached for so many years. One interesting point about the full-sized job, is that the built-up gear frames might well have been copied from one of my own little engines; not the first time, either, that your humble servant has anticipated Swindon practice! Also, the appearance of a new type of steam shunting locomotive, rather upsets the prognostications of those who prophesy wholesale "dieselisation" in the not-too-distant future. Personally, I don't think there is much fear of it, as oil has to be imported, whereas we have plenty of coal, if it can be dug out. The reconversion of the oil-burners to coal firing, was a plenty-good "distant signal." Time proves all things!

Sleeve-valves

Some correspondence has recently come to hand regarding the possibility of using sleeve-valve cylinders on little locomotives; and if so, would there be any likelihood of improvement in performance over ordinary slide- or piston-valves? My own humble opinion is, that the reverse would be the case; reason being chiefly the excessive friction. Now it so happens that I know just what I am talking about, when discussing sleeve-valves; for soon after I left the L.B. & S.C.R. in search of a bigger pay packet (the fatal error of my life, for I left my heart behind), I did some experimental work for a well-known firm of motor manufacturers. Part of this work consisted in testing a fully-loaded commercial vehicle over a distance of 5,000 miles under service conditions, with a free hand to carry out any individual tests that I thought might result in the acquisition of valuable data. I needn't go into details here,

even if space permitted; but the trouble we had with those bluepencil sleeve-valves, was just nobody's business. The firm got them somewhere near the mark, at the finish, and a number of both private cars and commercial vehicles were built with sleeve-valve engines, and put on the market; but any thermal efficiency that was gained, was completely negatived by a long tale of seized and broken sleeves, broken lugs, bent and broken connecting-rods, and various other ailments. In due course, the sleeve-valve stunt was abandoned, and the firm reverted to the usual type of poppet valve.



How to pack "Tich" pistons

Sleeve-valves were tried a long time ago on a full-sized locomotive. She was a 2-6-2 with outside frames, and was designed by Mr. C. W. (afterwards Sir Cecil) Paget, when works manager of the Midland Railway shops at Derby; she was built about 1908. The valves were adapted from the Willans central-valve high-speed stationary engine; and unlike those in the automobile engines mentioned above, they had a rotary motion in a separate steamchest. In the motor engines, the sleeves travelled up and down inside the cylinders, and the pistons worked inside the sleeves. This latter arrangement was the same as applied to the recent experiments on the Southern, in which one of the old Brighton Atlantics was fitted with a pair of fabricated sleeve-valve cylinders. The sleeves also were partly rotated during their back-and-forth movement.

It was found in the Paget engine, that approximately 30 per cent. more power was needed to drive the rotary valves in their separate circular steamchests, than was required to drive an ordinary pair of slide-valves. As the rotary sleeves were only about 10 in. diameter, you can just imagine the amount of friction set up by sliding sleeves working in an ordinary locomotive cylinder 19 in. diameter or thereabouts, and with pistons working inside them! In the days of Francis Webb and his compounds, a little honest-to-goodness criticism did not come amiss, and our departed friend had many a wordy battle with his critics; but nowadays, things seem to have altered, and it is now apparently considered rank heresy, to offer any criticism. Be that as it may, I am going to say right here, that every locomotive engineer knew, in his "heart of hearts" as the saying goes, that the sleeve-valves would be an absolute and complete failure in locomotive work, just as they eventually were in little motor-engine cylinders of 3 in. bore or thereabouts; and I am also going to borrow the mantle of Elijah, and venture to assert that the Southern 0-6-6-0 tank engine, built with sleeve-valve cylinders, chain-coupled wheels (a relic of George Stephenson's Killingworth engine) and bricked up sides to the firebox, will never do any useful work, and will certainly never become one of the British Railways standard types. For that matter, neither will the "spam cans" become a standard type. I expect most readers have heard the song "Anything that you can do I can do better"; and in my humble opinion, even if the Southern engine had been successful, a Garratt engine of similar capacity—a plain, simple, well-tried-and-proved job—would have been perfectly justified in singing that song to the former complicated box of tricks. In passing, it is curious how history repeats itself. Way back 120 years ago, when the Rainhill trials were held, the *Novelty* was acclaimed by press and public, as the last word in locomotive design, chiefly because she was different from the others—"so original and clever, you know." As every student of locomotive history knows full well, she was a dismal failure; it was the result of practical experience, embodied in the "blood and bone" of the old *Rocket*, that did the trick. Exactly the same thing is happening now; 'nuff sed!

Let those good folk who sought my advice on trying sleeve-valves in a little locomotive, try this experiment for themselves. Take an ordinary cylinder casting of the same type that I specified for *Doris*, *Hielan' Lassie*, or any similar engine. Bore it to the given piston diameter plus the extra required for a sleeve 3/32 in. thick; that is, $\frac{3}{16}$ in. larger than piston diameter. Now turn a sleeve to fit; this should be the length of the stroke, plus length of piston. The fit must be close enough to be steam-tight. Smear the outside of this with oil, insert it in the cylinder, and see how much power it needs, to move it up and down as quickly as you can move an ordinary slide-valve or piston-valve, of a size suitable for the same cylinder. After that test, I wouldn't mind betting that nobody who has tried it, would consider the idea of fitting sleeve-valves on the score of efficiency, even if they did it for the sake of experiment!

Beginners' Corner—Cylinder Assembly

The cylinder components being all made, we can put them together. First pack the pistons. Now the easiest and most satisfactory way I know of packing small pistons—and I have tried about every possible variation—is to use a kind of piston-ring made from square braided graphited yarn. This is a commercial article, which can be obtained at any stores, in most towns, who sell engineers' supplies. Some of our

advertisers sell it. For *Tich's* cylinders, you need a short piece of $\frac{3}{16}$-in. square section. All you have to do is to cut a piece about $\frac{1}{4}$ in. longer than the circumference of the groove in the piston; cut off both ends at an angle, as shown in the small detail sketch, and put the piece of packing in the groove in the piston, with the wedge-shaped ends interlocking. Although the nominal size is $\frac{3}{16}$ in. square, the actual size is a weeny bit larger; so roll the piston on something smooth (the lathe bed will do, you won't hurt it) pressing on the piston with a piece of perfectly smooth bar. This will press down the surface of the packing, level with the piston, or nearly so.

Now insert the piston into the cylinder, with the joint away from the passageways. It probably won't want to go in, the packing springing out a little from the groove in the piston; but it can be easily coaxed, by judicious prodding all around with a small screwdriver, or a pocket-knife blade which isn't sharp enough to cut the packing Press the piston in, at the same time as you prod all around, and a little care and patience will do the trick. When the piston is in the cylinder, it should be quite free to move up and down, yet by virtue of the "spring" in the packing, no steam will be able to blow past, the packing forming a perfect seal. Now you see what I mean by a piston being steam-tight, but not mechanically tight. If a piston is properly packed in the first place, and kept properly lubricated, it will remain steam-tight for an amazing length of time. It is years since I repacked old *Ayesha's* pistons, and I have lost count of the miles she has run, especially in my experiments with injectors. No steam blows by, yet she is so free that a push will send her running down the line, even when cold, Incidentally, I promised to record any repairs and replacements made to prevent her falling to pieces, as prophesied some 28 years or so ago. I have just fitted a new pair of trailing axleboxes, and a new pump eccentric. This is wide enough to take two straps, the second strap driving the mechanical lubricator, which was previously driven from one of the valve spindles. This arrangement allows more movement of the ratchet lever.

Cover Joints and Gland Packing

The cover joints can be made from 1/64-in. Hallite, or any other good brand of steam jointing; or oiled brown paper may be used. Beginners frequently have trouble with joints blowing badly, due to gaskets cracking or splitting, but they won't do either if you make them the following simple way. Whether using regular jointing material, or paper, the method is the same, but if paper is used, it should not be crumpled up, and the best kind to use is strong wrapping paper with a matt surface. Lay the cover on the bench, register upwards, and put a piece of jointing, or dry paper, over it; then rub your finger on the paper, which will "print" the outline of the cover on the surface of it. Cut out the inner circle (outline of register) *exactly to the line*, with a pair of small nail scissors (ask your wife or girl friend if she would like her nail scissors sharpened up a little, and it will be a good excuse for testing them by cutting the jointing material !) then slip the hole over the register, and cut the jointing all around, level with edge of cover. If using paper, put a smear of cylinder oil all around the cover flange before putting the paper over it. Put the cover, with gasket attached, over the cylinder flange, smearing same with cylinder oil first, if paper is used; then poke your scriber down each screw-hole, holding the cover on tightly, and make a puncture in the gasket under each hole. Put two opposite screws in, tightening sufficiently to hold the cover; the screws will enlarge the "punctures," but the gasket will be steam-tight around the screws. Then put the rest in, and tighten the lot in much the same order as those in a motor cylinder-head, when replacing same after decarbonising; opposite screws in turn. Joints put in thus, won't split, crack, or blow in what the kiddies call "donkey's years" and will prevent possible failures on the track.

The rectangular steamchest joints are cut out and applied the same way, but don't do them yet; just put three or four screws in temporarily, to hold the parts together. The steamchest covers will have to be taken off, for valve-setting purposes; and the joints can be made permanently after that is done.

The glands are packed with loose graphited yarn, another commercial product obtainable from the same sources as the jointing and braided material. It looks like thick black string, as sold. Cut off a few inches, and unravel it into separate strands; a dirty job, but if you rub some grease into your fingers first, the graphite will easily wash off, instead of becoming "grimed in," as my old granny used to say. Wind a few turns loosely around piston-rod and valve spindle, then prod it into the stuffing-boxes with a bit of stiff wire, flattened at the end. The stuffing-boxes should be almost full; cut off any surplus, then screw the glands in until the yarn starts to compress. The glands must not be too tight, or the packing will go hard, and score the rods. It is surprising how little pressure is needed to keep the steam in, when the packing is soft and springy. I have dilated on cylinders at length, as they are the heart of the engine; and all beginners should aim at putting their very best efforts into making them up.

Hooks for the Workshop

We have received some samples of a neat self-fixing hook which is being placed on the market by British Duplex Seals Ltd., 63-65, Piccadilly, London, W.1. These hooks are formed of compressed plastic and are supplied in nine different colours. To fix them all that is, necessary is to moisten the back, press firmly into position and leave for 24 hours when, it is claimed, they will carry up to 20 lb. weight. They can be used on glass, wood, metal or tiled surfaces.

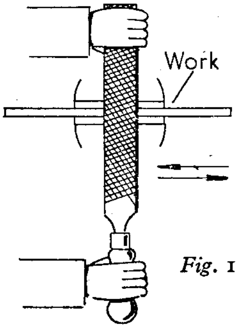


Fig. 1

Novices' Corner

Finishing Small Parts

FROM an inspection of metalwork submitted from time to time at exhibitions it is obvious that some of the entrants need advice on the correct methods to use when putting the finish on small parts. Experienced workers are in no difficulty about this matter, but the less experienced may work for a considerable time and make no progress unless they stumble quite accidentally on a process which gives them a pleasing finish or they are shown some well tried method by a knowledgeable friend.

Finishing can be applied to two classes of component, the first is that formed by a machining process, the second, parts which have been produced by a hand process such as filing.

So far as the amateur is concerned, the first class can be further sub-divided into: (1) components formed by turning and (2) those made either by milling or shaping. Turned work should require no other finish than that which is imparted by the tool itself. If it does then it is clear that either the tool is not sharp or the methods are wrong, always assuming, of course, that the lathe itself is in proper adjustment, a point often overlooked. The practice of applying emery-cloth to turned work cannot be too strongly discouraged, indeed except when polishing screw-heads, which will be referred to later, its use as a finishing medium is to be condemned.

Work machined by milling or shaping should require no further treatment except when desired to give a decorative effect by an additional hand process such as "frosting." Should the finish from the tool be rough, then the remarks previously made in connection with turned work apply with equal force.

If accuracy or a flat surface is not required the finishing of parts produced by hand is done by a variation of the filing process known as "draw-filing." Here, the file instead of being held in the usual manner, is gripped as shown in Fig. 1 and is applied to the work by being drawn backwards and forwards along it. A smooth, flat file is used for the purpose.

This method is particularly useful for finishing the edges of work.

Parts which have an irregular profile may also be draw-filed to a finish but it will be necessary in this case to use a half-round file for reaching into any hollows there may be. An example of a part having an irregular profile is seen in Fig. 2.

The edge of such a part could be draw-filed entirely by means of a half-round file using the flat and curved faces of the file where indicated.

The difficulty of finishing small components by filing so that their squareness and accuracy is maintained can readily be overcome if the usual procedure for filing is reversed that is if the work is taken to the file instead of the file being taken to the work. As an improvised method, a file may be caught in such a way that the surface of the file projects above the jaws of the vice; the work is then rubbed along the file in the direction of the cut and it will be found that there is little tendency for it to rock. Some workers prefer to *draw* the work towards them believing that this helps materially in keeping the filing true.

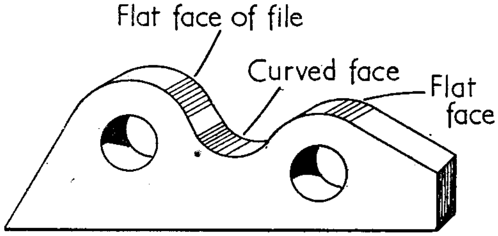


Fig. 2

If permanent equipment is required, a fine or second-cut file, 14 in.-16 in. long, should be selected, the tang should be removed by grinding a nick in it and snapping it off in the vice, and the "docked" file mounted on a wood base secured by fillets somewhat in the same way as an oil-stone. The file should be marked by a spot of yellow paint, or in some other suitable manner, to denote which side is to be kept for brass. Finally,

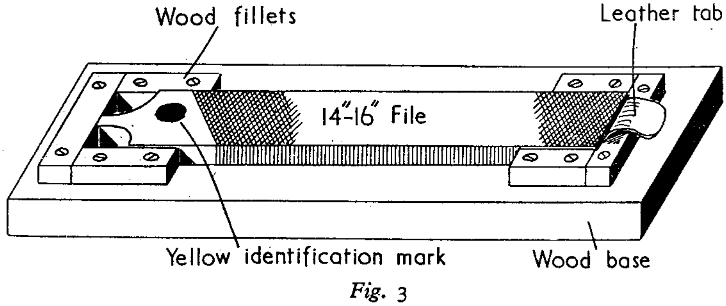


Fig. 3

for easy reversal, a leather tab is fitted on the board and under the file. Fig. 3.

The procedure just described is that used by instrument makers and others to get the close-grained finish commonly associated with high-class scientific apparatus, though in this case the parts, usually of brass, are afterwards given a coat of clear lacquer.

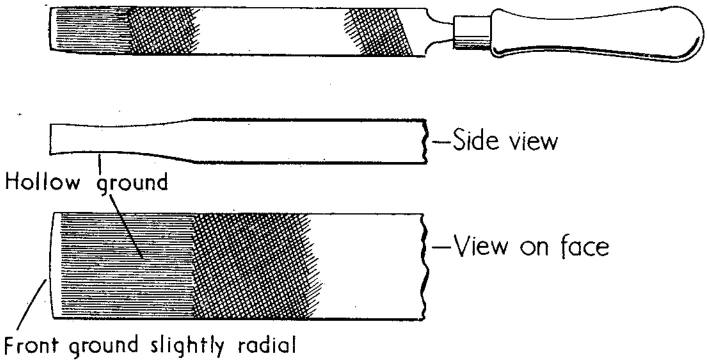


Fig. 4

Frosting

Reference has already been made to frosting, a finish that may be given either to flat machined surfaces or to the surface of parts which have been produced by hand-filing. The finish is imparted by means of a hand-scraper, a tool that is used primarily for the production of flat surfaces and may either be purchased or preferably made. Fig. 4 shows a typical scraper suitable for frosting purposes. It is made from an old flat file and has its tip ground to the form shown in the enlarged view.

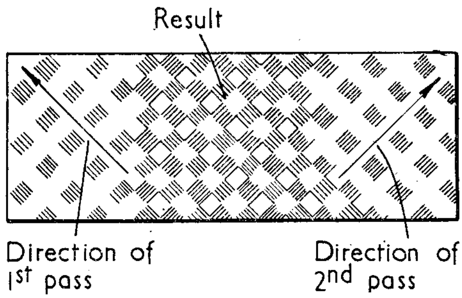


Fig. 5

Note that the face of the scraper is hollow ground to promote ease in sharpening on an oil-stone, whilst the front of the scraper is made slightly radial. The purpose of this is to prevent the corners of the scraper from digging in when in use.

It must be emphasised that the degree of sharpness given by the grinding operation is not sufficient for really free cutting, for the relatively rough edge will produce a correspondingly rough finish, moreover, the poor quality of the cutting edge will soon become blunted. Therefore the final sharpening must be carried out on an oilstone, for only by this means can a really sharp and lasting edge be produced.

Those who require further information on making and sharpening scrapers will find it in *Sharpening Small Tools*, published by Messrs. Percival Marshall & Co. Ltd.

Frosting is imparted by making a series of cuts across the work at some 45 deg. to the long

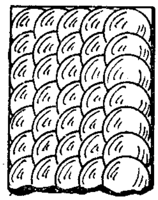


Fig. 6

axis and then crossing the cuts made by a further series at 90 deg. Fig. 5 will help to make the procedure clear.

Usually one pass in each direction is sufficient, but the surface finish of the work itself will dictate whether extra treatment is necessary.

A point in connection with frosting which needs emphasis is that it is the ideal finish for those who suffer from rust spotting, for it is only necessary to go over the affected part with the scraper to restore the original finish.

Engine Turning

A finish much in vogue at one time was that known as " engine turning. The surface has a series of interlocking circles formed upon it by rotating in contact with the work a felt pad charged

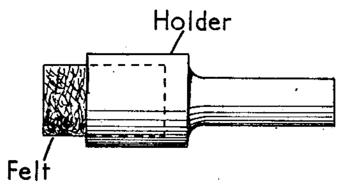


Fig. 7

with a suitable abrasive (see Fig. 6). This is usually done in a high-speed drilling machine to which some form of stop is fitted to control the amount of the downward feed as this affects the uniformity of the finish. In addition, a simple fence is fitted to guide the work, for without this the finish is again liable to lack of uniformity.

A Pad Holder

A suitable holder for the felt pad is shown in Fig. 7. Here it will be seen that the holder is drilled axially to receive the pad, which should preferably be of a hardish felt such as that used

for the wads of cartridges. A piece of brass or copper tubing may be used to take the felt, but usually the chucks fitted to high-speed drilling machines are of too small capacity to hold the size of tube required.

Our own method of imparting an engine-turned finish is to smear fine valve-grinding composition over the surface to be treated, then to carry out the engine turning, first laying a sheet of paper on the table of the drilling machine to prevent damage to the machine from the abrasive compound, after which the part is well washed in petrol or paraffin to remove all traces of the grinding composition. During the washing process the part must be carefully handled to ensure that it is not accidentally abraded, for the slipping of the fingers on the surface may easily spoil the finish.

The actual engine turning is done in the following sequence of operations :—

(1) Set the drilling machine stop so that the felt is compressed not more than $\frac{1}{16}$ in. when in contact with the work.

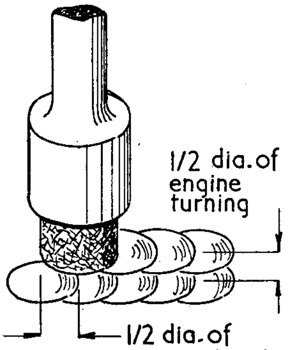


Fig. 8

(2) Coat the work with abrasive and place the work on drilling machine table.
(3) Start the machine and press the felt pad against the work.
(4) Raise the pad, move the work for a distance equal to half the diameter of the engine turning, again press the pad against the work (see Fig. 8).
(5) Repeat the procedure until a complete line of engine turning is produced.
(6) Commence the operation again, moving the work sideways for a distance equal to half the diameter of the engine turning.

Engine turning should be used with discretion. It is suitable for scientific instruments but is quite out of keeping on machine tools where the frosting used on the working surfaces of the slides has a definite practical value, apart from that of ornamentation, in breaking up the surface and allowing it to retain an oil film. Engine-turned parts made from brass may subsequently be lacquered, which greatly improves the finish.

Finishing Bolt and Screw Heads

Commercial bolt heads should never be left in the condition as received. The parting-off face is usually rough so must have a finishing cut taken across it, whilst the surfaces of the hexagon will require to be filed (see Fig. 9). The file is applied in the direction of the long axis of the bolt. In addition to these two points it will often be found that the chamfer on the head is eccentric. This must be corrected by re-machining. If the shank and bolt head are eccentric it may be better to discard the particular bolt and select one which does run true. If, however, no further bolt is

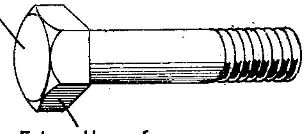


Fig. 9

available the shank may be gripped in the four-jaw chuck and set so that the head runs true.

The heads of cheese-headed screws may be polished by catching the shank of the screw in the chuck of the drilling machine and bringing the head down in contact with a sheet of fine emery-cloth laid on the drilling machine table.

Round-head screws may be gripped in the chuck and their heads polished with emery-cloth wrapped lengthwise on a flat file. (Fig. 10.)

After polishing, bolts and screws may, if desired, be given a blued finish. This colouring is most effective in contrast with aluminium and

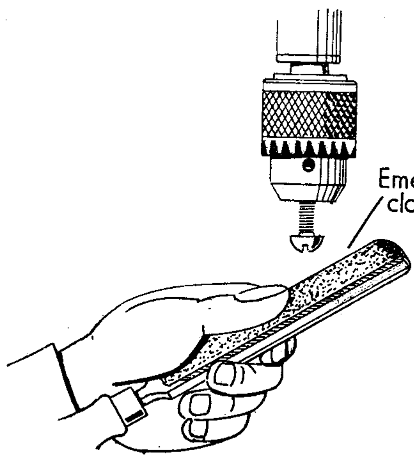


Fig. 10

brass, particularly when the latter has been lacquered, and screws finished in this way look well on scientific apparatus. The screws, themselves, should also be lacquered after blueing, as this intensifies the colouring.

It is not proposed to go into the process of blueing, for this has only recently been described by " Duplex " in article No. 53, " In the Workshop," published on December 29th, 1949. Those who wish to colour screws and may be in doubt about the method, should refer to this article.

The Special

"Odd folks, these British, aren't they?"

by Lt. Col. A. G. Bates

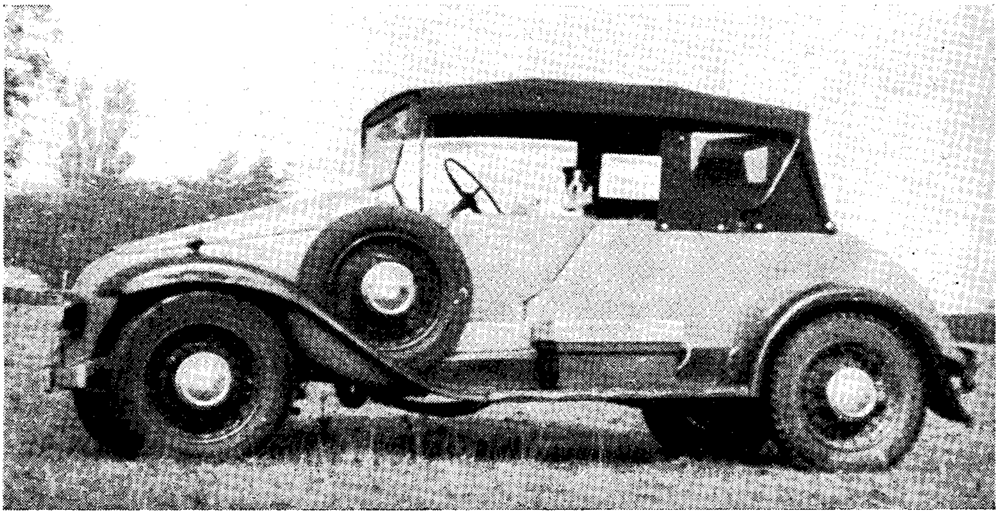
"ODD folks, these British, they'll put up with almost anything and then... some trivial event... and they're off non-stop."

It all began with the ration books. They had to get to the office before closing time. No, I mean the food office, not the local—three miles away, a bare half-hour, no "basic" and not on a "permitted route." Well, we managed it and groused like anything. But when that same night whole charabanc loads of football fans drove four hundred miles just to get tickets for a replay, all under the smiles of authority, that just tore it.

Except for the chassis, the traction motor, and a metal rectifier, everything was *ex*-service and mostly from "M.E." advertisers. Navy, Army and Air Force were all represented and even the U.S. Navy got a share—they made good switches. The foundation of the design was the battery, the size of its 12-volt units prescribing both the motor characteristics and the space needed. Design is perhaps the wrong word. Certainly there was never any master plan one could look at. It was more like a mental cinema screen across which a whole army of possible schemes chased themselves, each inspired by a glimpsed adaptation of some component.

Also, it was all great fun, and with the assistance of friend G (for garage), a wizard with a welding torch and some angle-iron, we got to work on a Bedford van which was very definitely dead.

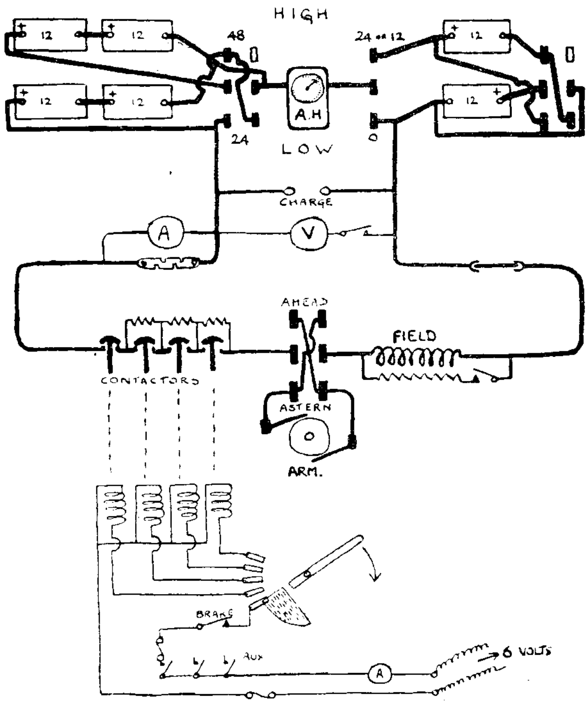
Series-wound traction motors seemed scarce, but eventually we happened on one. Though sound, parts of it were very old and its armature was electrically lop-sided in that some two-thirds of its winding had a different gauge of wire to the rest. We put it in as it was and fed it on 60 volts, but having been designed for 48 it objected. Later, it was set upon by a ship repairer and after being endowed with blast cooling and the sort of brushes it liked, it can now absorb 5,000 watts at 72 volts for lengthy periods, and stand overloads of up to 200 amps without turning a hair. Previously, this would have meant sparks, smoke, smell and a hurried shut down. With current of this order, ohms are fatal even in minute doses, and big fat connections are essential Crashed bombers have the best cable for the job.



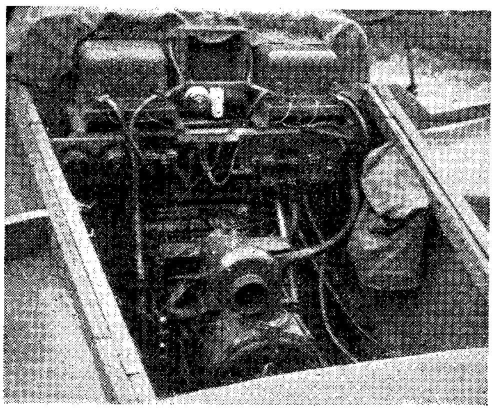
The Special

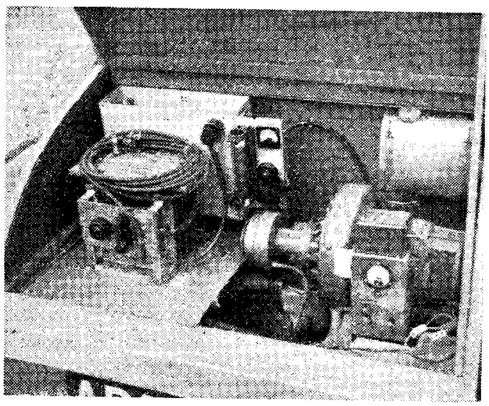
The control system shown has given no bother whatever. The king-pins are the C.A.V. aero engine starter switches used as contactors to short out the motor series resistances when getting under way. Solenoid operated, they work well on 6 volts which is used for all auxiliary purposes, lamps, horn and so forth, and is obtained by tapping any convenient section of the battery. The average current so used is barely 3 amps, which is too small, in relation to propulsion current, to have any noticeable effect on the state of charge of the cells concerned. Switching enables 24, 48 or 72 volts to be used at will for the motor, but except for starting and traffic work, full voltage is used throughout, the motor field being weakened by a diverter when more speed is demanded.

A valuable feature is the gearbox from an old Triumph, partly because of its free wheel, but also because it reduces the drain on the battery under severe hill conditions. Most electrics have an axle ratio carefully selected to suit the ruling gradient and operating conditions of the milk round. The Special, however, had to be a " go-anywhere " job. For normal main road work the gearbox is not used and reverse is obtained electrically. It was quite a while before we tumbled to the fact that if electrical reverse was used on top of mechanical reverse the net result was that you went ahead ! . . . very slowly and with immense tractive effort.



Wiring diagram, showing method of control by solenoid-operated contactors. Cables carrying motor current shown in heavy lines


Under the bonnet. Motor with blower on top


The tail. Left—Transformer rectifier. Right—Tank heater generator

The charging department is housed in the stern. On the port side aft is a transformer rectifier enabling a 10-amp charge rate to be obtained from any 5-amp a.c. mains socket. On the starboard side is a petrol-driven generator of American make which came out of a tank, where its job was to keep the main engines warm and the tank batteries charged. It gives a 1,500-watt output and a most effective battery boost when needed. In emergency it allows you to proceed petrol/electric at a stately 6 m.p.h.

As to performance, the three miles to the station are regularly covered in 9½ minutes which can be cut to 8½ when time is short. She has travelled 36 miles in 1 hour 50 minutes, the consumption working out at 146 watt hours per ton mile. The batteries are rated at 168 A.H. at the 5-hour rate. On good roads she uses 3½ A.H. per car mile, and we reckon that one unit from the mains propels us 2.4 miles.

The Special has now completed a year's trouble-free running and has been absorbed into the ordinary work routine. Indirectly, I suppose she owes her origin to Hitler, but it was the affair of the ration books that tipped the scales.

Odd folks, these British, aren't they ?

Improvements and Innovations

No. 7—Water

by "1121"

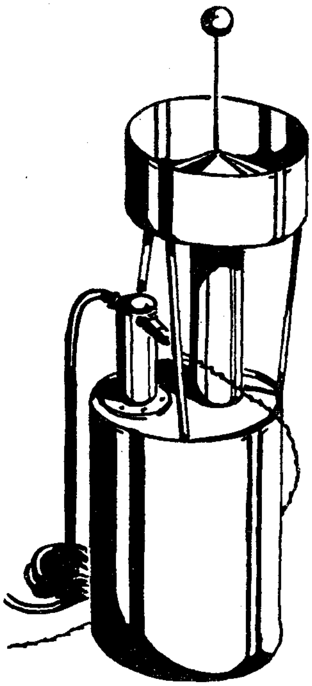
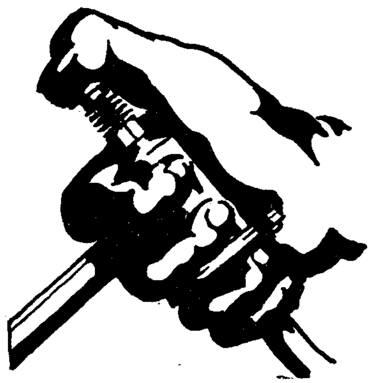


Fig. I. *Storage and—*

THE problem of maintaining a supply of water for the engines running at an exhibition may, to some, seem a simple one, but hard continuous running with heavy loads with frequent changes of engines, renders our staff (which may be severely limited at certain times of the day—first thing in the morning, mealtimes, etc.) hard pressed to handle all the work with which they are faced. One man will be driving (or perhaps two), another loading passengers, another may be cleaning down the previous engine and thinking about which one is to be got ready next, and so on. Add to this the fact that the test stand may be giving a demonstration, requiring another man to operate another engine, and it becomes clearly necessary to eliminate the job of struggling through the crowd with a bucket of water every hour or so. In the old days our equipment consisted of a small storage tank and three or four one-gallon cans, a funnel for filling tenders, a clean-water bucket for fetching the water, and a dirty-water bucket into which to mop up the mess resulting from over-filled cans, etc.

At one exhibition we wondered why we were making an unusual amount of mess, until we discovered that one of the cans was leaking through a small hole in the side. We forthwith retired the offending vessel from active service, but it still seemed that we were doing an awful lot of floor-mopping. A little later on we discovered why our efforts were having little effect—our dirty-water bucket was itself surreptitiously returning its contents to the floor via its own private leak.

We decided that something would have to be done, and schemed out all sorts of elaborate water-crane ideas, all more or less difficult to install and operate, and quite impossible to pack up and transport on a lorry. The final outcome was the simple affair shown in the sketch Fig. 1, and the section Fig. 3. It consists of two five-gallon oil drums suitably butchered, and fitted up with one of the ex-aircraft petrol pumps which have been advertised in the past in these pages. This has a prodigious rate of delivery, and takes only a fraction of the time to fill a tender compared with the old method of pouring it out of a can through a funnel. The pump as supplied was provided with a flange, which could be slid up and down for height adjustment, and six screws hold this down to a similar ring welded to the top of the lower drum, with a piece of jointing material between. It should be noted that this joint must be water-tight, or the head of water when the apparatus is filled to the top tank will cause leakage here. The upper and lower tanks are connected by a pipe, as shown, the top one being offset slightly to allow withdrawal and assembly of the pump.



—Delivery. (*Fig.* 2)

The only "crane" necessary is a piece of hose long enough to reach to the locomotive on the track and to the steam-raising department, terminating in a nozzle incorporating a plunger valve, which is normally in the "off" position by virtue of a spring, and the water-pressure when the pump is running. At a pinch a wheel-valve will do, but it is slow to operate, and a valve of sufficient bore to ensure the unrestricted flow of water required by these pumps is large and clumsy. We give a sectional view of the valve (Fig. 4), and it will be observed that the

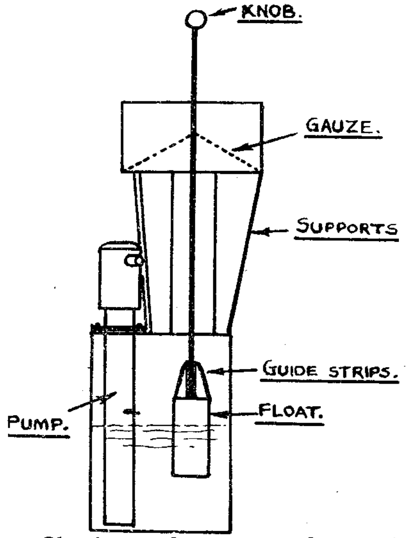


Fig. 3. Showing tank, pump, and water-level indicator (not to scale)

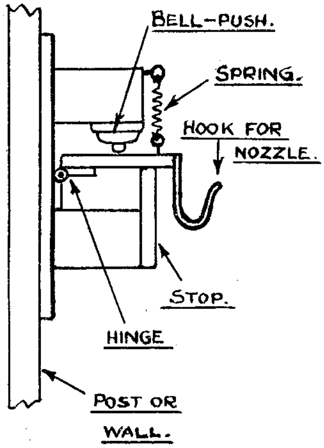


Fig. 5. A simple switch

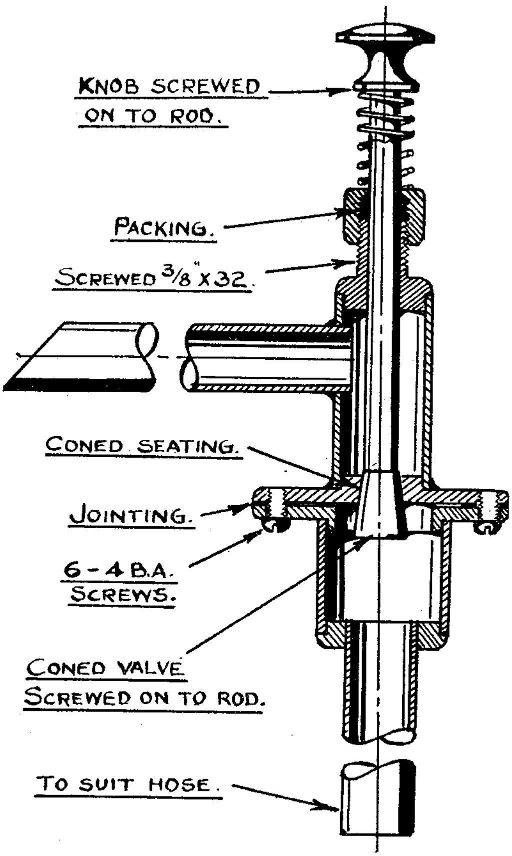


Fig. 4. Sectional view of the valve

gland is arranged on the " delivery " side, as distinct from the " pressure " side, to eliminate leakage. The shape of the valve itself was evolved after first trying a plain flat disc, which was found to be difficult to regulate against the " snapping shut " action of the water-pressure. We have not given dimensions on the drawing, as our valve was made from all sorts of odd blanks and bits of tube, and presumably any others will be too.

When not in use the nozzle hangs on a hook, which incorporates a switch to the pump motor. This hook is placed in a convenient position to be readily accessible to the driver's hand when he arrives at the end of the track. The action of unhooking the nozzle automatically switches on the motor, and he has only to press the knob with his thumb to a greater or lesser extent to obtain the flow of water he wants. Releasing the knob immediately cuts off the water, and hanging up the nozzle stops the pump. The switch on our outfit is a special one which we doctored for our particular purpose, but we give a sketch showing how an ordinary bell-push could be incorporated in the scheme to give the same result (Fig. 5).

The device entirely eliminates mess, and the water-tank can be filled first thing in the morning before the crowd gets in, and lasts some hours. To enable us to keep a check on the water-level a rough gauge has been rigged up, as shown in the section of the tank, consisting of a length of stiff wire attached to the top of a float, and surmounted by a red knob. The wire passes up through a hole in the centre of a conical gauze filter, which serves the double purpose of keeping the wire vertical, and preventing any bits of rag, etc., being dropped into the tank and getting mixed up with the pump.

On some occasions our water is supplied in carboys, the local tap water being unsuitable, and in this case we whip our pump out of its tank and pop it down the spout of the carboy, which it fits just nicely.

The Ransomes' Compound 6 n.h.p. Traction Engine

Another Addition to the "M.E." Blueprint Service

by W. J. Hughes

THE name of Ransomes was one of the first, if not *the* first, in the field of "self-moving" engines, and it is fitting that an example of one of their engines should be included in the list of traction-engine blueprints.

I have prepared the latter to $1\frac{1}{2}$-in. scale from official blueprints kindly loaned by Mr. L. J. Smallbone, chairman of the Basingstoke M.E.S., and am very grateful to him for the loan. In addition, I owe thanks to Messrs. Ransomes, Sims & Jefferies for the supply of prints of some details, which have been of great assistance, and for permission to reproduce.

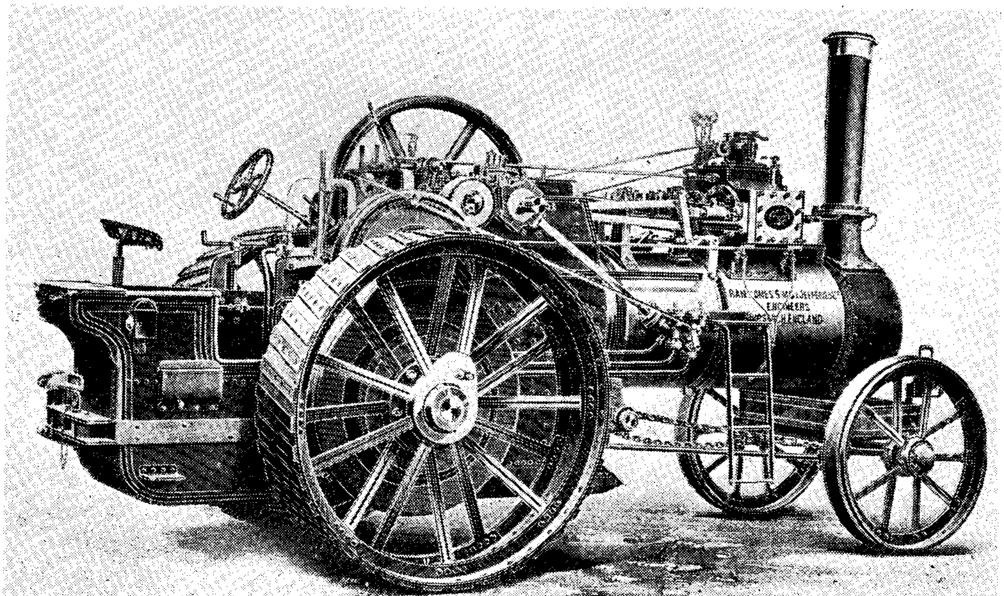
The subject of the present prints—there are two sheets—is the 6 n.h.p. compound, which is shown in the first photograph. The cylinders were $5\frac{3}{4}$ in. and 9 in. in bore, and 10 in. stroke, and the working pressure was 180 p.s.i. Normal speed was 160 r.p.m., giving nominal road speeds of $1\frac{1}{2}$ and 3 m.p.h.

There was a separate lever to operate each change-speed clutch, but a tilting interlocking bar ensured that both gears could not be engaged together. Details of this simple but ingenious mechanism are given in Sheet Two of the drawings, which also includes a cross-section through hind axle, differential, and winding-drum, as well as other details of the engine.

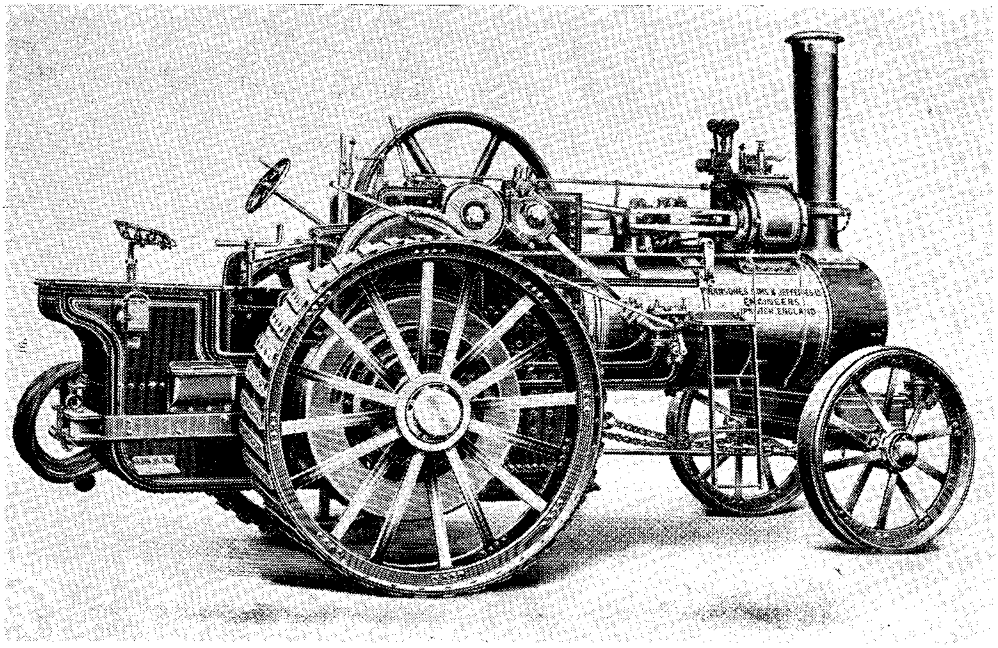
The flywheel is dished to bring the rim well in, and further careful attention to design ensured a narrow engine only 6 ft. 11 in. wide, a very useful feature in country lanes and in the restricted area of the stackyard, too.

Each crosshead slid between four slide-bars, the outer ends of which were supported by a cast motion bracket. Stephenson link-motion drove the valves, which were placed at the sides of the cylinder-block. The weigh-bar shaft was carried in cast brackets bolted to wrought-iron ones fitted to the boiler top.

The illustrations were taken from a catalogue of 1921, and show a Gardner type governor, but Pickering governors were fitted to earlier engines, and are shown in my drawings.



The Ransomes, Sims & Jefferies compound 6 n.h.p. traction-engine. Note pump on side of boiler-barrel, rectangular spud-pan, rectangular chimney-base, and small ladder to inspection-platform



The single-cylinder Ransomes traction-engine. Shape of slide-bars is easily seen. Note, too, the water filling pocket used as footstep

A winding-drum carrying 50 yards of wire rope was fitted to the left-hand side of the hind axle, and could be released to allow the rope to pay out as the engine travelled forward.

My second illustration shows the single-cylinder version of this light traction-engine. Details are much the same as the compound, though the gear change was arranged with one lever only, there being more room on the crank-shaft which allowed a method similar to the Allchin described in a former article.

Principal Dimensions

Length overall, 17 ft. 3 in.; Width overall, 6 ft. 11 in. Height to top of chimney, 10 ft. $11\frac{3}{4}$ in.; Hind wheels, 6 ft. × 1 ft. 4 in.; Front wheels, 3 ft. $8\frac{1}{2}$ in. × 9 in.; Flywheel, 4 ft. 6 in. × 6 in.; Weight of engine, empty, $9\frac{1}{2}$ tons.

The drawing, No. T.E.10 (Sheets 1 and 2) price 7s. 6d., is obtainable from Percival Marshall & Co. Ltd., 23, Great Queen Street, W.C.2.

For the Bookshelf

The December-January, 1949-50, issue of our popular contemporary, *Railway Pictorial and Locomotive Review* contains a reprint of Mr. O. S. Nock's most able and informative paper on "The Relationship of Signalling and Brake Power in the Handling of Modern Traffic." This is a subject which should be much more widely understood than it is, and the paper deals very fully with it.

We note that with the February, 1950, issue, *Railway Pictorial* will revert to monthly publication, maintaining its present style of production but at 1s. 6d. instead of 2s. 6d. per issue.

The Lynton & Barnstaple Railway, by L. T. Catchpole. (The Oakwood Press, South Godstone, Surrey.) Fourth edition. 6s. net.

We are pleased to see that this little volume has now reached a fourth edition; for it is a classic of its kind, serving, as it does to inform its readers very fully about the history, development and final demise of one of the most popular of England's minor railways. Popular, that is, with the tourist and holiday-maker; but the promoters and owners had a hard struggle to keep the little line going.

Mr. Catchpole tells the whole story in a fascinating style, and he pays due regard to the technical and mechanical features.

The illustrations, which are printed on art-paper inserts, include a coloured frontispiece depicting a typical train in appropriate scenic surroundings; the rest are from carefully selected photographs which speak for themselves. Various maps, plans and thumbnail sketches are interspersed in the text. A description and general-arrangement drawing of the Manning, Wardle & Co.'s 2-6-2T type of locomotive which worked on the line add a great deal to the technical interest of the book.

Queries and Replies

Enquiries from readers, either on technical matters directly connected with model engineering, or referring to supplies or trade services, are dealt with in this department. Each letter must be accompanied by a stamped, addressed envelope, and addressed: "Queries Dept.," THE MODEL ENGINEER, 23, Great Queen Street, London, W.C.2.

Queries of a practical character, within the scope of this journal, and capable of being dealt with in a brief reply, will be answered free of charge.

More involved technical queries, requiring special investigation or research, will be dealt with according to their general interest to readers, possibly by a short explanatory article in an early issue. In some cases, the letters may be published, inviting the assistance of other readers.

Where the technical information required involves the services of an outside specialist or consultant, a fee may be charged depending upon the time and trouble involved. The amount estimated will be quoted before dealing with the query.

Only one general subject can be dealt with in a single query; but subdivision of its details into not more than five separate questions is permissible. In no case can purely hypothetical queries, such as examination questions, be considered as within the scope of this service.

No. 9751.—Stroudley's Improved Engine Green.
E.E.S. (Corbridge)

Q.—Where is the type of paint known officially as "Stroudley's Improved Engine Green" obtained? The paint would be required for outside use and must be weatherproof. Could you also give an exact technical description of the lining-out used on locomotives and tenders during the Stroudley regime?

R.—We do not know of any source of supply of the paint known as "Stroudley's Improved Engine Green." In spite of enquiries, the original formula seems never to have been discovered.

However, a very good approximation is obtained by tinting dark yellow ochre with orange chrome, with about 2 per cent. in bulk of sage green.

Particulars of the lining-out of Stroudley locomotives are as follows:—

Cab sides, side tanks, or tenders were bordered with sage green. On the inner edge of this border was a black stripe, about 1 in. wide, with a vermilion line on the edge next to the green, and a white line on the inner edge. Boiler bands were painted black and had a fine vermilion line down each edge. On the boiler barrel itself, immediately next to the bands, was a $1\frac{1}{2}$-in. sage green stripe with a white line on the edge next to the yellow (or improved engine green).

Valences and footsteps were painted a maroon colour, what is known as burnt sienna seems to give the best effect here. There was a black stripe all round the outer edge, and this black stripe had a fine yellow line on the inner edge, next to the maroon. It now transpires that the main frames were painted black, but the guard-irons were painted bright vermilion, as were also all sand pipes. Wheels were painted the same colour as the engine but the axle ends in the middle of the bosses were sage green, tyres were painted black with a sage green band on the inner edge.

Finally, buffer beams were bordered with maroon and the buffer sockets were painted in the same colour. In the middle of the beam was a bright vermilion panel, bordered with a black edge with a white line on the inner edge and a yellow line on its outer edge.

No. 9750.—Calculating Displacement.
W.E.P. (Ashford)

Q.—I have drawings of a scale model tramp steamer which I wish to build, but I understand that for a working model you must have extra displacement. Is this complicated to work out, or could you give me a simple formula to enable me to do this?

I have already made one or two exhibition models but so far have not made a working model.

R.—The simplest and most useful method of calculating the displacement of a working model ship is that of using the block co-efficient. This is a figure based on the nature of the underwater body, and represents the percentage of its actual cubic capacity when compared with the cubic capacity of a rectangular body whose length, breadth and depth equal those of the ship or model in question.

It is obvious that if the underwater body was rectangular in both plan and elevation, the weight of water displaced would equal the length $\times$ breadth $\times$ depth $\times$ 0.036, this figure being the weight of one cubic inch of water in pounds. As the underwater body is cut away to decrease its resistance through the water, its cubic capacity is somewhat less than that of the rectangular body whose displacement we have just calculated. Therefore, we must multiply the weight we have already found by the block co-efficient as defined above. This figure varies for different types of ships, as shown in the following table:

Slow ocean-going cargo steamers	0.77 to 0.82
Moderate speed, ditto	0.67 to 0.78
The later sailing vessels	0.65 to 0.75
Battleships (of 1918)	0.60 to 0.65
Fast passenger steamers	0.56 to 0.65
Clipper ships	0.50 to 0.60
Fast cruisers and destroyers	0.44 to 0.53
Tugs	0.45 to 0.53
Steam yachts	0.35 to 0.45

For full size ships, the dimensions are reckoned in feet and the product when multiplied by 35 for salt water or 35.9 for fresh water, gives the displacement in tons.

No. 9759.—Starting Difficulties
J.E.B. (Nantwich)

Q.—I have completed a 15-c.c. o.h.v. Kittiwake petrol engine intended for a hydroplane hull. The ignition is by a unit M.I. magneto, driven at half engine speed from front of engine, which looks neat, but I am expecting starting difficulty in obtaining an initial spark. Is there a method of temporarily connecting up a small battery at the pond side without detaching the whole magneto from the engine? I noted at the "M.E." Exhibition a racing car being started up on the circular track with what appeared to be a short stick with battery and wires attached. I do not know if this car had coil or magneto ignition itself, but this arrangement appeared to be a kind of booster ignition for starting up.

R.—It is possible to "boost" a small magneto by applying battery current to the coil with a suitable switching arrangement for changing over to self-generating when the engine is under way.

There is, however, a great risk that by energising the coil from a battery, the magnet of the magneto may become demagnetised, and it is extremely difficult to avoid this, as it will be appreciated that, on each half revolution, the coil is liable to be energised in the wrong direction to suit the magnet.

We note that you are driving the magneto at half engine speed, which must necessarily affect the starting efficiency to a great extent, as it is difficult to turn the engine over fast enough to obtain a good spark under these conditions. We suggest you try driving the magneto at engine speed, under which conditions it will fire a spark every revolution, and alternate sparks will, therefore be fired on the exhaust stroke of the engine, and will serve no useful purpose, but on the other hand, they will do no harm and ensure that a good starting spark is obtained.

With reference to the starting battery device you saw at the "M.E." Exhibition, we are of the opinion that this would be applied to engines with glow-plug ignition which need only the application of a battery when starting, and can afterwards be completely disconnected from any electrical supply.

No. 9765.—Stage Dimmers.
E.L.F. (Eire)

Q.—For small stage lighting effects, I need a dimmer capable of taking care of three 100 W lamps, 220 V a.c. I have written to the G.E.C., but all their dimmers are hand-operated, the travel of the dimming slide being too long for my needs. I intend to have a dimmer operated by a fractional h.p. motor geared down, and this is the reason why I need a dimmer with a short slide travel so that a crank or cam can be used. Would you kindly suggest something that I could build myself, giving particulars of materials to be used?

R.—There are several types of variable rheostats which might be used for the purpose you require, but we regret that we have no exact data on their design, and a certain amount of experiment would be necessary to obtain the results specified. A very simple type of rheostat which has been extensively used in the past for dimming stage lights is a simple water resistance, consisting of an insulated vessel having two plates immersed in water, and some method of varying the distance between them.

Apart from its simplicity of construction, this is one of the most flexible devices in respect of handling different loads, as the current-carrying capacity and resistance can be varied by altering the size of the plates, or by varying the conductivity of the liquid by the addition of salt solution or acid to the water.

Another possible type of rheostat which could be operated by a crank or cam movement is the carbon pile type of resistance, in which carbon discs or granules are pressed between two pressure plates. Here again, there is no available data on exact dimensions of the elements required for handling a given load.

No. 9758.—Flywheel Magneto Coils
J.D.A. (Livingstone, Northern Rhodesia)

Q.—I have acquired a nice little twin-cylinder outboard engine for use on the Zambezi. However, the previous owner had had a little bother with the ignition, and after his friend had taken the magneto coil to pieces in an attempt to "put it right," he destroyed the existing coil which would have provided the information for a rewind. The information I have is as follows:—The engine is a twin two-stroke with flywheel magneto ignition, both cylinders firing simultaneously, there being one cam on the crankshaft for ignition. The core is composed of seventeen stampings riveted together. The stem on which the coil is situated is $\frac{3}{8}$ in. square and the available length for the coil is approx. $1\frac{1}{4}$ in.

R.—It is rather difficult to give you definite advice on the rewinding of the coil for your flywheel magneto, as we are not familiar with the particular type. We presume that a single coil, or at least a single unit, is employed to supply the ignition spark to the two cylinders, and in such cases, it may be designed in either of two ways.

(a) The coil may have a single primary winding, and two entirely separate secondary windings, the inner ends of which are connected to the outer end of the primary winding, and the outer ends to the high tension leads of the individual plugs.

(b) A single secondary coil may be used, completely insulated from the primary by means of a fairly thick insulating tube, and not connected to it in any way. Each end of the secondary is then "alive" and is connected to one of the plug leads.

In either case, the coil may have a primary winding, consisting of 150 to 200 turns of 20-gauge enamel-covered copper wire, and the secondary should be composed of 12,000 to 15,000 turns of No. 40 gauge enamel-covered wire, layer wound, and each layer insulated by paper interleaving not less than 0.003 thick. The paper should not be varnished or otherwise treated before winding, but the entire coil should be completely impregnated with moisture-resisting varnish and stoved after winding.

PRACTICAL LETTERS

International Racing

DEAR SIR,—As an official of the M.P.B.A. I have hitherto avoided entering this somewhat controversial discussion, but feel that there appear to be some misunderstandings and misconceptions revealed in the various correspondence. I refer in particular to the letter of our old friend, G. M. Suzor, which was published recently.

The statement that it is hopeless to hold meetings for home-built engines may apply to the Continent but not to this country, where we have a large number of competitors who prefer to build their boats throughout.

I would also query these following points from M. Suzor's letter " . . . as very few of our actual model engineers are able to design their own engines and certainly even less have the workshop facilities to build them " and " . . . model engineers worthy of international class are certainly capable of building an equivalent power plant, if not a better one."

These two statements appear hardly to agree.

Now with reference to straight-running events —this is a red herring which should not really have been raised ; it was originally quoted by Mr. G. Stone in his article on the Geneva regatta. *There has never been any suggestion so far of holding an international regatta for straight-running boats as far as the M.P.B.A. is concerned.* The Model Power Boat Association encourages all types of craft and in inter-club regattas this policy is adhered to by holding events for all types of boats. Last year there were twelve club regattas held beside the " International " and the " Grand " which are put on by the M.P.B.A. Of these two the " International," is for speed craft only while the " Grand " is for all types. including speed boats, but normally it is not open to foreign competitors. For the last two visits (in 1947 and 1948) however, M. Suzor has attended the " Grand " regatta by invitation, in any case, he is now a life member of the M.P.B.A. and thus eligible.

I would like to say, in regard to holding spectators interest, that while it is desirable, it does not matter *very* much, since regattas are first and foremost for the benefit of the participants—whatever sort of boat they may run.

With regard to Victoria Park lake, I am inclined to think that it is much maligned. I am aware of the " return wave " trouble due to sheer sides, which give rise to capsizing in certain craft, but hope to see this overcome by certain experiments that are being conducted by the committee. I am of the opinion, which has been borne out by Mr. G. Lines with his new boat, that hulls *can* be designed to run at Victoria Park (or other waters) at high speeds. Mr. Lines has reached 64 m.p.h. without any signs of diving or " flipping " backwards. This performance, which unfortunately was timed with only one watch, was made at Victoria Park.

I would like to make quite clear that competitors with commercial-engined speed boats receive precisely the same welcome as those with home-built engines, but at least for the time being the home-built and commercial-engined boats do not race directly against one another, this being the ruling of the M.P.B.A. At the moment it does seem that ready-made engines have a distinct advantage—I refer to the 10 c.c. class. The Dooling was produced after 42 different prototypes had been made (see Col. Bowden's book *Model Glow-plug Engines*) and it is evident that the home-built enthusiast is up against quite a problem in attempting with limited equipment to equal the performance of such engines.

In conclusion, may I offer best wishes for the New Year to M. Suzor and all model power boat builders everywhere and hope that 1950 will prove another successful season.

Yours faithfully,
Sidcup. JOHN H. BENSON.

The Vertical Boiler Roller

DEAR SIR,—First of all, congratulations on the front cover of THE MODEL ENGINEER for January 5th.

I should like to confirm Mr. K. N. Harris's remarks *re* the road roller. The steering was carried out by a horizontal rod across the roller with a worm working on a segment of worm-wheel which was attached to the frame carrying the front rollers with a vertical hand-wheel for operating same. I have a blueprint of this and as the roller was used outside my house when the road was resurfaced, I was able to have a good look at it, in fact, started making a model of it, but then passenger-carrying locomotives got the better of me and I gave the roller up. It should build up into a very pleasing model. Twin-cylinder horizontal engine—single eccentrics but some American type of valve-gear—K. N. H. would know what this would be.

Yours faithfully,
London, N.12. G. H. W. RANDELL.

Surface Propeller Speed Boats

DEAR SIR,—May I take the opportunity of answering a request in Mr. E. A. Walker's letter in THE MODEL ENGINEER of December 8th, in which he asks for information on four-stroke surface propeller boats. Here are the main dimensions of my " B " class boat *Sharkie*. Length 33 in., max. width 9 in. tapering to 5 in. at the stern, step $1\frac{1}{4}$ in., two sponsons 3 in. wide by $8\frac{1}{2}$ in. long at 1 in 24 angle, propeller shaft centre $\frac{7}{8}$ in., thrust parallel with the bottom of hull. Total weight 6 lb. 12 oz. approximately, a quarter of which is on the propeller strut which brings the centre of gravity about 6 in. behind the step. A photograph appears in the September 15th issue.

Anyone who has seen the boat running will confirm that she is quite stable at 40 m.p.h. even on rough water. Actually, the maximum speed reached was 45 m.p.h., the propeller used being of 5 in. pitch by $2\frac{3}{4}$ in. diameter. Although I only managed to attend three regattas last year with this boat, an appreciable amount of running has been obtained, the engine proving very constant and reliable.

I do not claim outstanding performance or credit for the design, as this hull is the result of considerable information supplied by Mr. H. A. Scott, of the Chicago M.P.B.A.

For a 30-c.c engine, I would suggest a length of 36 in., width 11 in., step $1\frac{3}{8}$ in., propeller centre depth $1\frac{1}{8}$ in. Everything should be made as light as possible and I think the all-up weight should not exceed 10 lb. With normal luck it is hoped that a boat of these dimensions would be completed by next season.

I trust the above will be of interest to readers concerned with speed boat matters.

Yours faithfully,

Cricklewood. H. V. COLLINS.

Removable Boiler Flues and Robey Tractions

DEAR SIR,—The type of boiler illustrated in THE MODEL ENGINEER for December 22nd last, is founded on Biddell and Baulks patent, and was first used on portables made by Ransome, Sims and Head, of Ipswich, in 1858. It was "re-invented" about 1900 by a German firm who applied it to superheated semi-portables, and it became a standard type for the very efficient engines of this class built both in Germany and this country. I remember a much abused Lanz engine with a boiler of this type, which was kept continuously in steam for over a year, supplying electric light to a country town. Eventually, tube trouble developed; the engine was coupled to another boiler, the firebox withdrawn and the repairs carried out with the engine still working on top of the shell!

Robey's certainly did make traction engines. One of my earliest recollections is of a very interesting "Pig Trough" engine. It was then about 25 years old, but was one of the hardest worked threshing engines in my neighbourhood. Many types were built by Robey's including some very early Thompson engines. In more recent times, their overtype steam wagons and tractors were quite the best of their type, particularly in regard to their boilers (with the stayless fireboxes) and their very efficient piston-valves.

Yours faithfully,

Norwich. GEOFFREY K. KING.

CLUB ANNOUNCEMENTS

Stephenson Locomotive Society

The pioneer body of its kind, the Stephenson Locomotive Society, celebrated the 40th anniversay of its foundation at a dinner held at the Charing Cross Hotel, London, during December. The president, Mr. J. N. Maskelyne, A.I.Loco.E., occupied the chair and in welcoming the ladies and guests, mentioned the valued co-operation enjoyed with the officers of British Railways. Mr. G. R. Grigs, chairman of the Railway Correspondence & Travel Society, responded to the toast. Mr. George Dow, Public Relations Officer, London Midland Region, entertainingly proposed the toast of the society which was acknowledged by Mr. L. E. Brailsford, vice-president and founder of the society in 1909 who detailed some reminiscences of the early days and paid tribute to colleagues and past officers. The society had grown in numbers, prestige and activities to a greater extent than ever imagined during the first decade. Mr. A. J. Boston, chairman of the society, offered the toast "British Railways" which was responded to by Mr. D. S. Barrie, M.B.E., Public Relations Officer, Railway Executive, also a long-standing member, in another witty speech. The notable expansion of the S.L.S., in the provinces with a number of flourishing centres administered by a team of voluntary officers, as is the London Headquarters, also the large number of members overseas, was emphasised by Mr. R. A. H. Weight, the society's publicity officer, in proposing "The Areas and Absent Friends." The final speech in acknowledgment appropriately came from Mr. W. H. Whitworth, vice-president and life member, who for 26 years managed the affairs of the Midland and North Western branch, now divided into several areas and centres each arranging meetings or visits. Versatile musical entertainment was provided by Miss Kathleen Ingram and Mr. Ernest Bartram. Mr. Brailsford arranged an interesting exhibition from his collection of letters, photographs and souvenirs of the society's earlier days and notable occasions. Excellent fare and service added to the pleasures of a notable evening.

Sutton Coldfield and North Birmingham Model Engineering Society

We are glad to report a very healthy state of affairs. Membership is now past 90, and some fine attendances have been put in at recent meetings.

Future meetings are as follows:—

Tuesday, January 31st. Open Night.

Tuesday, February 14th. Technical Film Night. Given by member W. H. Parsons.

Tuesday, February 28th. "Model Racing Hydroplanes." By K. Williams, holder of the British speed record.

All meetings at 7.30 p.m. at the Yenton Hotel, Sutton Road, Erdington.

Dearne District Society of Model and Experimental Engineers

The above society is just over twelve months old, and now have 40 members. Meetings are held on the third Saturday in the month at 7 p.m., in the Wesleyan Chapel, Chapel Street, Wath-on-Dearne.

Secretary: G. H. HILL, 26, West End Road, West Melton, Rotherham.

The Warrington Model Engineering Society

The meetings of the above society in the near future are:—

Friday, February 3rd. Meeting at clubroom, Mr. W. J. Thompson (of the Eccles society), will give a lecture on "Locomotive Valve-gears."

Monday, February 20th. A meeting in the workshop behind clubroom, when Mr. Whiston will give demonstrations of oxy-acetylene welding and brazing. Members are invited to bring along any items they require doing, and provided there is time, the lecturer will braze or weld the parts as required.

Friday, March 3rd. A meeting at the clubroom when Mr. R. Burns's father-in-law will give a talk on his experiences driving full-size locomotives on the L.M.S. Railway.

This meeting may have to be altered at a later date if our lecturer is unable to be present on account of his duties on the railway, in such an event Mr. F. L. Clarke will bring his 5-in. gauge "Maid of Kent' locomotive, and will talk on the construction of same to date.

Monday, March 20th. A meeting at the clubroom when Mr. G. Beckett will bring his radio-control boat and transmitter, and will demonstrate and explain the action of the radio-control mechanism.

All meetings at the clubroom are of added interest if members will remember to bring bits and pieces for general discussion prior to the regular business of the evening being commenced.

Clubroom: 21-23, Church Street.

Hon. Secretary: P. G. CLAYTON, 68, Hallows Avenue, Orford, Warrington.

The Junior Institution of Engineers

Proposed East Midland Group. Thursday, January 26th, at 7 p.m., Mechanics' Institute (Room 71), Burton Street, Nottingham. Ordinary meeting. Paper, "Welding,' by E. W. Harding, B.Sc., M.I.Mech.E., A.M.I.E.E.

Friday, January 27th, at 6.30 p.m., 39, Victoria Street, Westminster, S.W.1. Informal meeting. Paper, "Electrical Distribution in Large and Small Workshops," by Robert J. Merralls. (Member.)